2009 CHERY A1 Service Manual

FOREWORD

This manual contains on-vehicle service and diagnosis procedures for the Chery A1.

A thorough familiarization with this manual is important for proper repair and maintenance. It should always be kept in a handy place for quick and easy reference.

The contents of this manual, including drawings and specifications, are the latest available at the time of printing. As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Chery dealers. This manual should be kept up-to-date.

Chery Automobile Company, Ltd. reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

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NOTE:

This A1 service manual only applies to the following engines and transaxles:

- **1.3L with M/T**
- **1.3L with AMT**

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Wuhu, Anhui Province, CHINA

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01

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HOW TO USE THIS MANUAL

Topics

This manual contains procedures for performing all required service operations.

The procedures are divided into three basic operations:
- Removal/Installation
- Disassembly/Assembly
- Inspection

Service Procedures

Most repair procedures begin with an illustration. It identifies the components, shows how the parts fit together and describes visual part inspection. Removal & Installation procedures have written instructions.

Service procedures include the following elements:
- Detailed removal & installation instructions
- Integrated torque specifications
- Integrated illustrations
- Component specifications

Diagnostic Procedures

The diagnostic procedures are divided into the following two groups:

Diagnostic Trouble Codes (DTC)

- DTCs are important hints for repairing malfunctions that are difficult to simulate. Perform the specific DTC diagnostic inspection to quickly and accurately diagnose the malfunction.

Diagnostic Symptoms

- Symptom troubleshooting quickly determines the location of the malfunction according to symptom type.

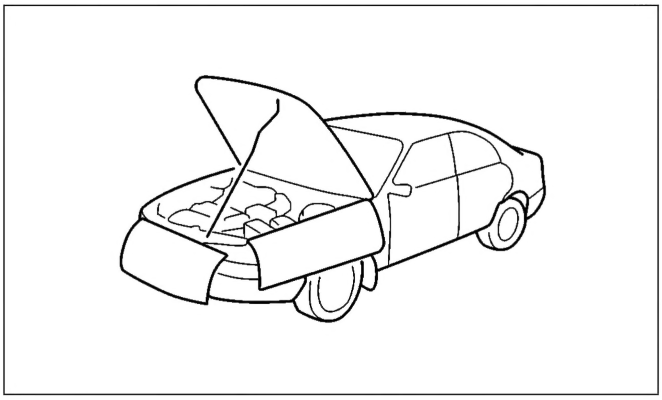
Specifications

This manual contains specifications that are divided into the following groups:
- Torque specifications
- Clearance specifications
- Capacity specifications

VEHICLE SERVICE PREPARATION

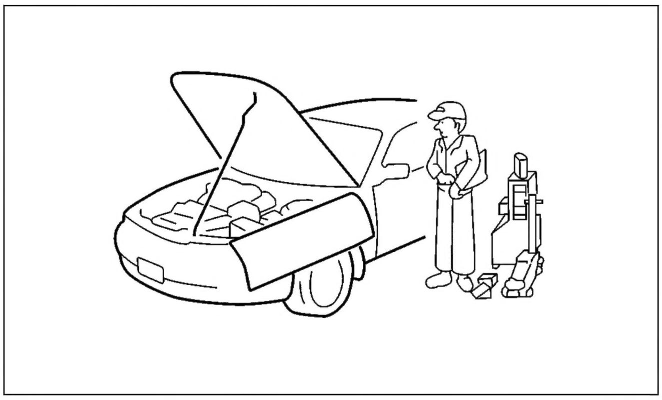
Preparation For Vehicle Service

- Always be sure to cover fenders, seats and floor areas before starting work.



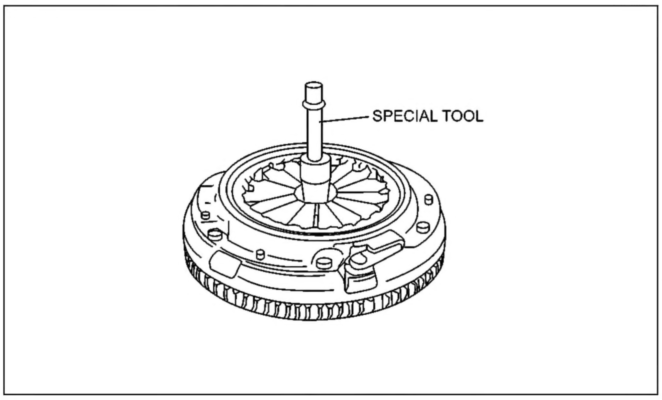
Tools and Testing Equipment

- Be sure that all necessary tools and measuring equipment are available before starting any work.
- Inspect the vehicle and reference any needed service information before starting any work.



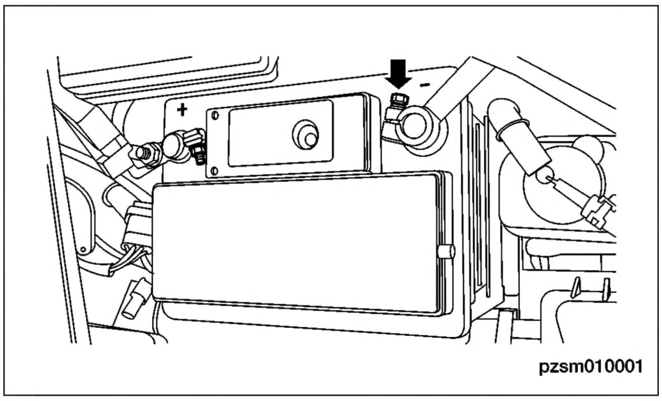
Special Tools

- Use special tools when they are required.



Disconnection of the Negative Battery Cable

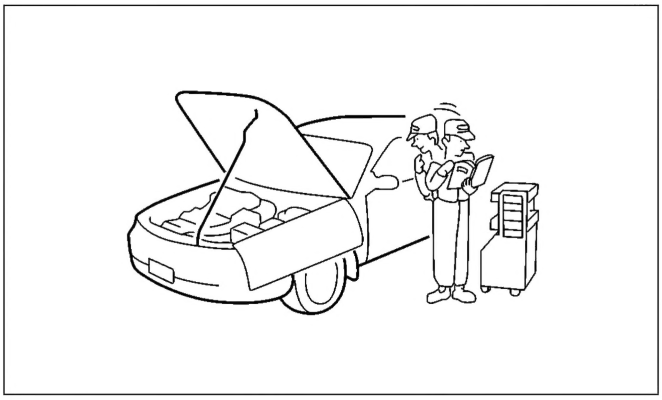
- Before beginning any electrical work, turn the ignition switch to LOCK, disconnect the negative battery cable and then wait two minutes to allow the backup supply of the air bag diagnostic monitor unit to deplete its stored power.
- Disconnecting the battery cable deletes the memories of the clock, audio and DTCs, etc. Therefore, it is necessary to verify those memories before disconnecting the cable.



PROPER SERVICE PRACTICES

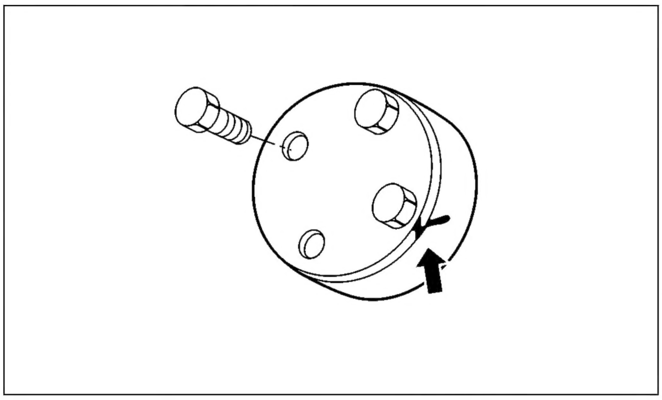
Removal of Parts

- While correcting a problem, also try to determine its cause. Begin work only after first determining which parts and subassemblies must be removed and disassembled for replacement or repair. After removing the part, plug all holes and ports to prevent foreign material from entering.



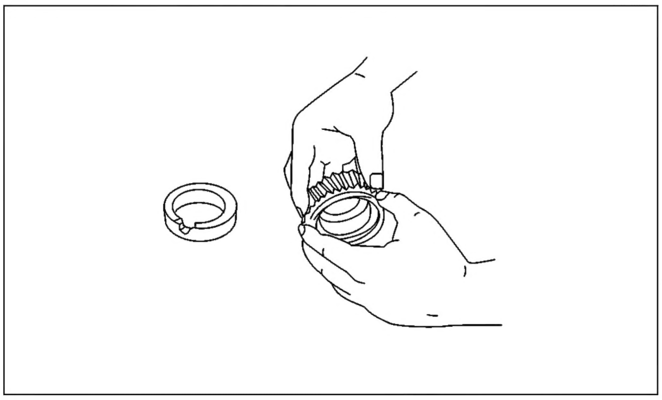
Component Disassembly

- If the disassembly procedure is complex requiring many parts to be disassembled, make sure that all parts are disassembled in a way that will not affect their performance or external appearance. Identify parts so reassembly can be performed easily and efficiently.



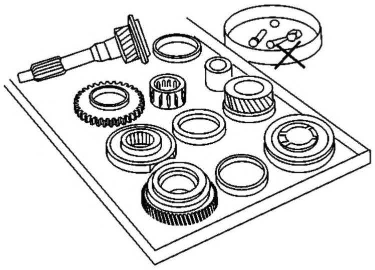
Inspection of Parts

- When removed, inspect each part for malfunctioning, deformation, damage and other problems.



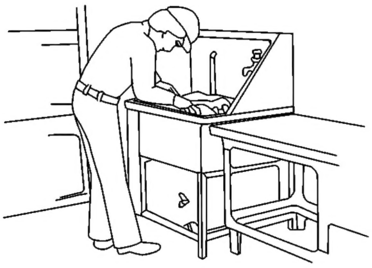
Arrangement of Parts

- All disassembled parts should be carefully arranged for reassembly.
- Be sure to separate and identify the parts to be replaced from those that will be reused.



Cleaning of Parts

- Carefully and thoroughly clean all parts to be reused.

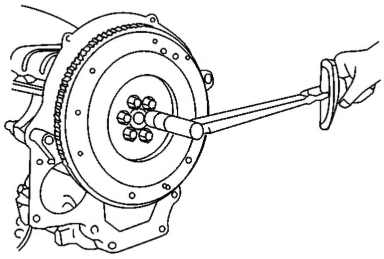


WARNING!

Using compressed air can cause dirt and other particles to fly out causing injury to the eyes. Wear protective eye wear whenever using compressed air.

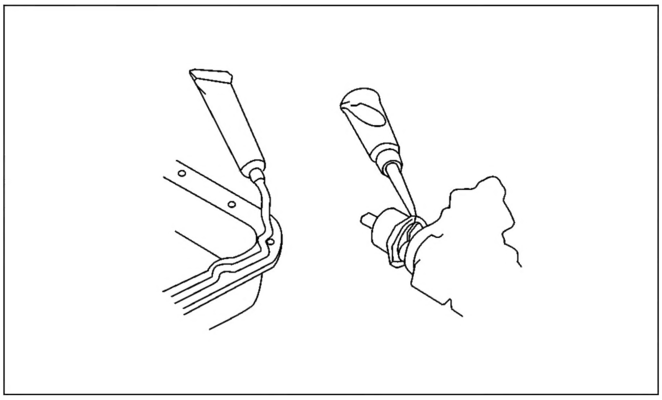
Component Reassembly

- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts. If removed, replace these parts with new ones:
  - Oil seals
  - Gaskets
  - O-rings
  - Lock washers
  - Cotter pins
  - Nylon nuts



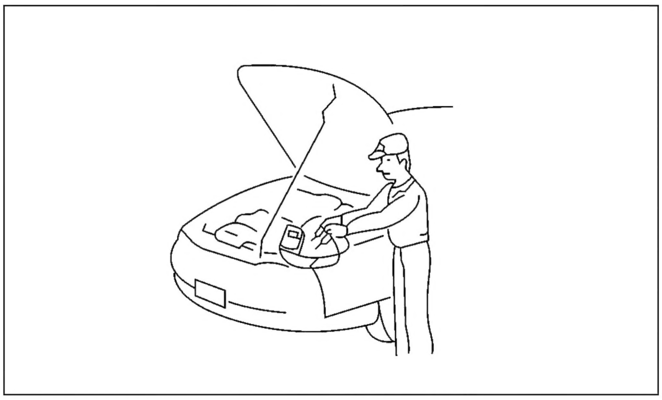
Depending on location:

- Apply sealant and gaskets, or both, to specified locations. When sealant is applied, install parts before sealant hardens to prevent leaks.
- Apply oil to the moving components of parts.
- Apply specified oil or grease at the prescribed locations (such as oil seals) before reassembly.



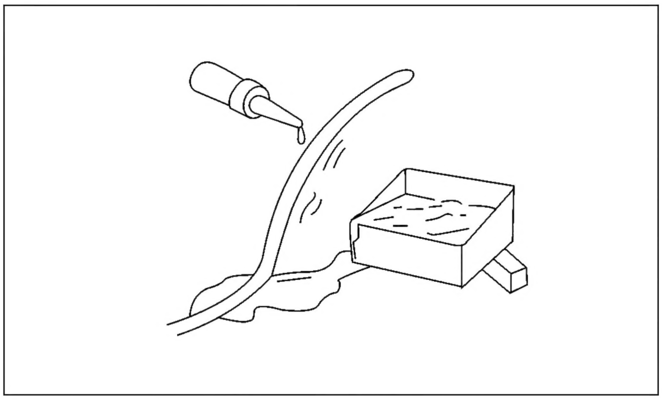
Adjustments

- Use suitable gauges and testers when making adjustments.



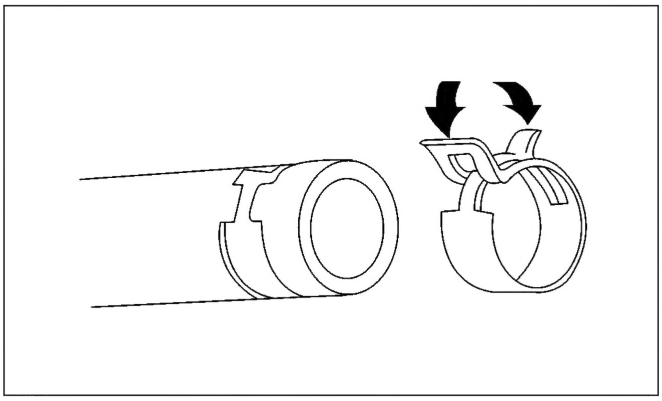
Rubber Parts and Rubber Tubing

- Prevent gasoline or oil from getting on rubber parts or tubing.



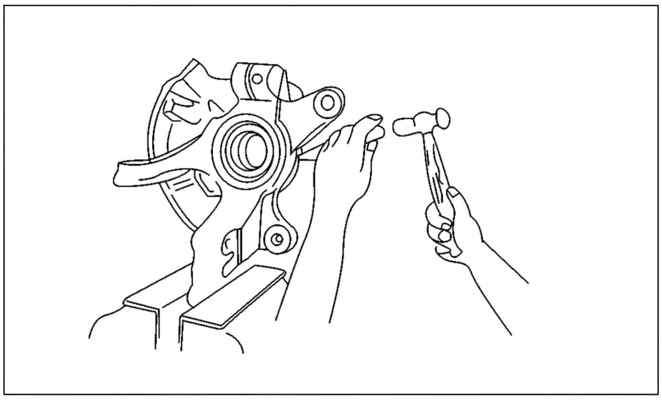
Hose Clamps

- When reinstalling, position the hose clamp in the original location on the hose and squeeze the clamp lightly with large pliers to ensure a good fit.



Vise

- When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.



Dynamometer

- When test-running a vehicle on a dynamometer:
  - Place a fan, preferably a vehicle-speed proportional type, in front of the vehicle.
  - Connect an exhaust gas ventilation unit.

WARNING!

Exhaust gases can injure or kill. They contain carbon monoxide (CO), which is colorless and odorless. Breathing it can make you unconscious and can eventually poison you.

  - Cool the exhaust pipes with a fan.
  - Keep the area around the vehicle uncluttered.
  - Monitor the engine coolant temperature gauge.

VEHICLE INFORMATION

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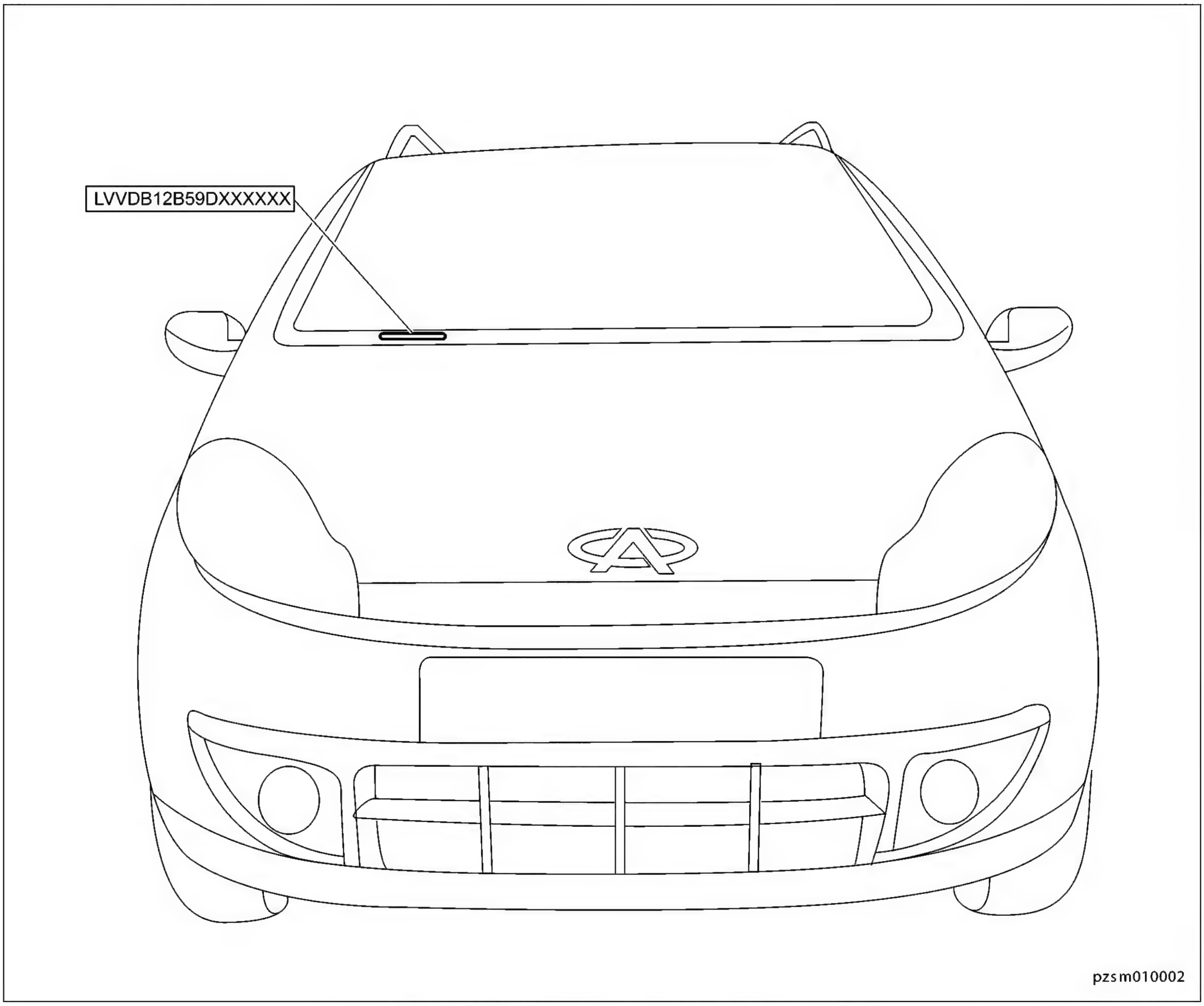
VEHICLE IDENTIFICATION NUMBER (VIN)

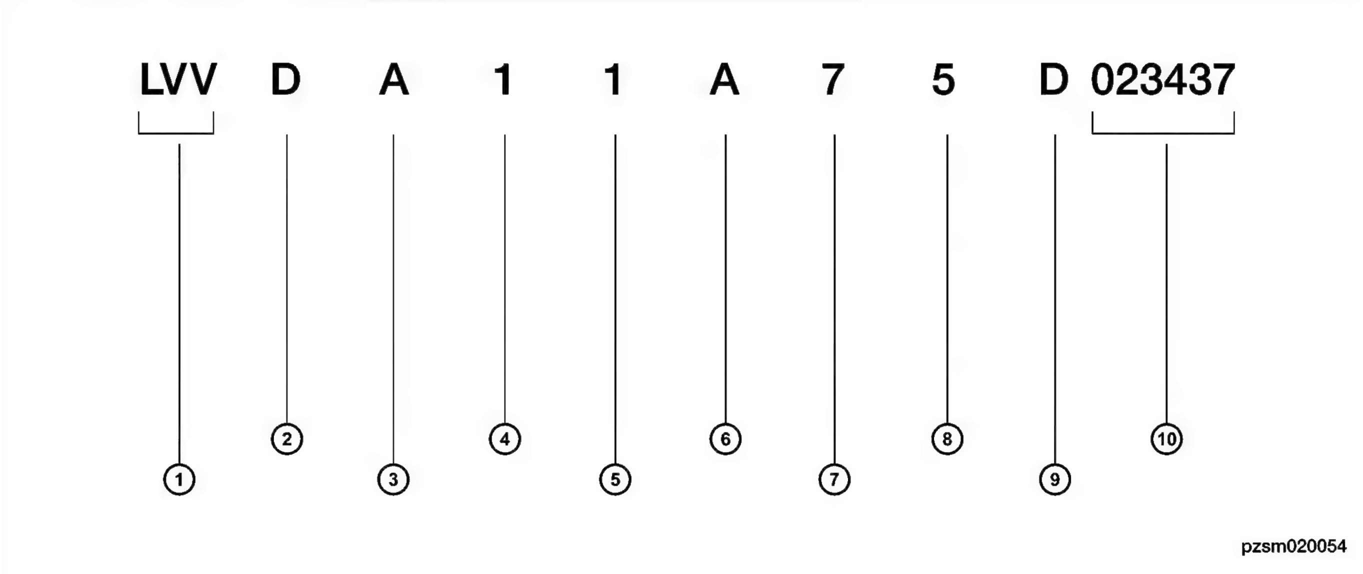
VIN Location


LVVDB12B59DXXXXXX
pzsm010002

Vehicle Identification Number (VIN) Tag Location

The VIN is printed on a plastic tag attached to the top right corner of the upper instrument panel. The VIN is also found on the vehicle certification (VC) label.

VIN Identification Codes



The vehicle identification number (VIN) is a 17-digit combination of letters and numbers.

VIN DIGIT DESIGNATION	DEFINITION
1	World Manufacture Identifier
2	Brand Of The Vehicle
3	Vehicle Chassis Type
4	Transmission Type
5	Engine Type
6	Restraint System
7	Check Digit
8	Model Year
9	Assembly Plant
10	Production Sequence Number

- **Digits #1, #2, #3** The first 3 vehicle identification number (VIN) positions are the world manufacturer identifier:
  - ″LVV″ represents Chery Automobile Co., Ltd.
- **Digit #4** The fourth digit of the VIN code represents the brand of the vehicle:
  - The brand ″Chery″ is represented by the letter ″D″.
- **Digit #5** The fifth digit of the VIN code represents the body configuration of the vehicle:
  - ″A″ represents three compartments, five-door, and 4X2.
  - ″B″ represents two compartments, five-door, and 4X2.
  - ″C″ represents three compartments, four-door, two-lid, and 4X2.
  - ″D″ represents two compartments, five-door, and 4X4.
- **Digit #6** The sixth digit of the VIN code represents the type of transmission:
  - ″1″ represents manual transmission.
  - ″2″ represents automatic transmission.

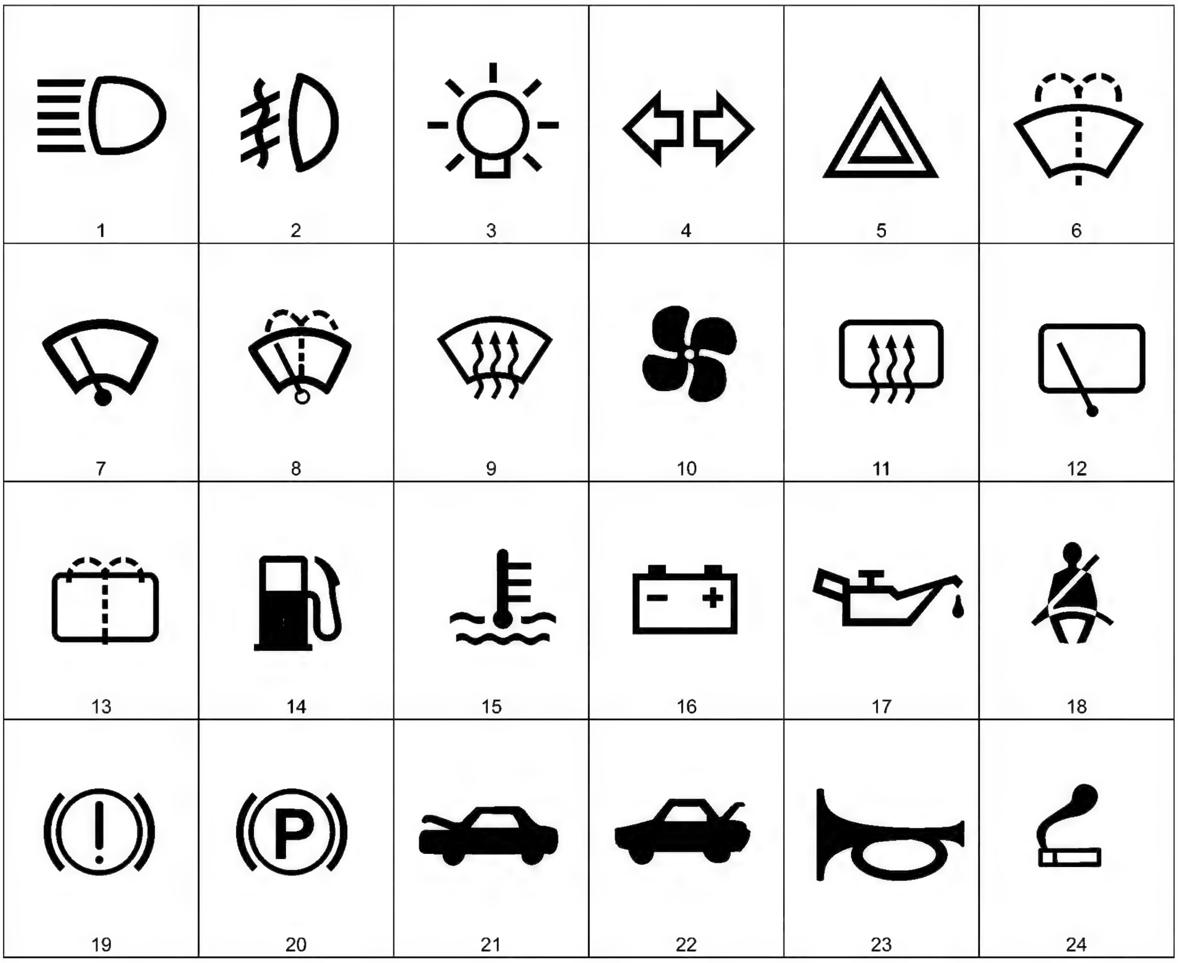
- **Digit #7** The seventh digit of the VIN code represents the type of engine:
  - ″1″ represents electronically controlled gasoline engines 1.5L - 2.0L (excluding 2.0L) series.
  - ″2″ represents engines smaller than 1.5L (excluding 1.5L).
  - ″4″ represents 2.0L - 2.5L engines (excluding 2.5L).
- **Digit #8** The eighth digit of the VIN code represents the Restraint System:
  - ″A″ represents manual safety belts.
  - ″B″ represents manual safety belts plus air bags in the front row.
- **Digit #9** The ninth digit of the VIN code is the check digit:
  - It is to check accuracy of VIN record, and is made out through computation after confirming the other sixteen digits of the VIN.
- **Digit #10** The tenth VIN position represents the model year code:
  - ″5″ represents the year 2005.
- **Digit #11** The eleventh VIN position represents the assembly plant code:
  - ″D″ represents the ″Chery Automobile Co., Ltd.″
- **Digits #12, #13, #14, #15, #16, #17** The last six VIN positions represent the production sequence number.
  - This represents the actual production number of the vehicle.

INTERNATIONAL SYMBOLS

International Symbols

The graphic symbols illustrated in the following International Control and Display Symbols chart are used to identify various instrument controls. The symbols correspond to the controls and displays that are located on the instrument panel.

International Control and Display Symbols



besm010003

1 - High Beam
2 - Fog Lamps
3 - Headlamp, Parking Lamps, Panel Lamps
4 - Turn Signals
5 - Hazard Warning
6 - Windshield Washer
7 - Windshield Wiper
8 - Windshield Wiper and Washer
9 - Windshield Defroster
10 - Blower Motor Fan
11 - Rear Window Defroster
12 - Rear Window Wiper

13 - Rear Window Washer
14 - Fuel
15 - Engine Coolant Temperature
16 - Battery Charging Condition
17 - Engine Oil
18 - Seat Belt
19 - Brake Failure
20 - Parking Brake
21 - Hood
22 - Trunk
23 - Horn
24 - Cigarette Lighter

FASTENER USAGE

Fastener Usage

WARNING!

Use of an incorrect fastener may result in component damage. Failure to follow these instructions may result in personal injury or death.

Fasteners and torque specification references in this Service Manual are identified in metric format.

During any maintenance or repair procedure, it is important to salvage all fasteners (nuts, bolts, etc.) for reassembly. If the fastener is not salvageable, a fastener of equivalent specification must be used.

ELECTRICAL CIRCUIT DIAGNOSIS INFORMATION

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- Electrical Circuit Simulation Tests 01-16
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DIAGNOSING ELECTRICAL FAILURES

Performing Efficient Electrical Circuit Diagnosis and Troubleshooting

STEP	DESCRIPTION
Step 1	Obtain detailed information about the conditions and the environment when the electrical incident occurred.
Step 2	Operate the affected system, road test the vehicle if necessary. Verify the parameter of the incident. If the problem cannot be duplicated, refer to “Electrical Failure Simulation Tests”.
Step 3	Gather the proper diagnostic material including the following: • Electrical Power Supply Routing Diagram • System Operation Descriptions • Applicable Service Manual Sections • Check for any Service Bulletins Identify where to begin diagnosis based upon your knowledge of the system operation and the customer comments.
Step 4	Inspect the system for mechanical binding, loose connectors or wiring damage. Determine which circuits and components are involved and diagnose using the Electrical Power Supply Routing Diagram and Harness Layouts.
Step 5	Repair the circuit or replace the component as necessary.
Step 6	Operate the system in all modes. Verify the system functions properly under all conditions. Confirm you have not inadvertently created an additional new incident during your diagnosis or repair steps.

Electrical Circuit Simulation Tests

Often the symptom is not present when the vehicle is brought in for service. If possible, re-create the conditions present at the time of the incident. Doing so may help avoid a No Trouble Found Diagnosis. The following illustrates tests to simulate the conditions/environment under which the owner experiences an electrical incident.

The tests are broken into the seven following topics:
- Vehicle Vibration Test
- Heat Sensitive Test
- Freezing Test
- Water Intrusion Test
- Electrical Load Test
- Cold or Hot Start Up Test
- Voltage Drop Test

NOTE :
Always get a thorough description of the incident from the customer. It is important for simulating the conditions of the problem.

Vehicle Vibration Test

The problem may occur or become worse while driving on a rough road or when the engine is vibrating (idle with A/C on). In such a case, check for a vibration related condition. Refer to the following vehicle areas:

Connectors & Harness

- Determine which connectors and wiring harness would affect the electrical system you are inspecting. Gently shake each connector and harness while monitoring the system for the incident you are trying to duplicate. This test may indicate a loose or poor electrical connection.

NOTE :
Connectors can be exposed to moisture. It is possible for a thin film of corrosion to form on the connector terminals. A visual inspection may not reveal this without disconnecting the connector. If the problem occurs intermittently, perhaps the problem is caused by corrosion. It is a good idea to disconnect, inspect and clean the terminals on related connectors in the system.

Sensors & Relays

- Gently apply a slight vibration to sensors and relays in the system you are inspecting. This test may indicate a loose or poorly mounted sensor or relay.

Engine Compartment

- There are several reasons a vehicle or engine vibration could cause an electrical complaint. Some of the things to check for are:
    - Connectors not fully seated.
    - Wiring harness not long enough and is being stressed due to engine vibrations or rocking.
    - Wires laying across brackets or moving components.
    - Loose, dirty or corroded ground wires.
    - Wires routed too close to hot components.
- To inspect components under the hood, start by verifying the integrity of the ground connections (See Ground Inspection described later). First, verify that the system is properly grounded. Then check for any loose connections by gently shaking the wiring or components as previously explained. Using the electrical schematics, inspect the wiring for continuity.

Behind The Instrument Panel

- An improperly routed or improperly clamped harness can become pinched during accessory installation. Vehicle vibration can aggravate a harness which is routed along a bracket or near a mounting screw.
- An unclamped or loose harness can cause wiring to be pinched by seat components (such as slide guides) during vehicle vibration. If the wiring runs under seating areas, inspect wire routing for possible damage or pinching.

Heat Sensitivity Test

The customer's concern may occur during hot weather or after the vehicle has sat for a short time. In such cases you will want to check for a heat sensitive condition.

To determine if an electrical component is heat sensitive, heat the component with a heat gun or equivalent.

CAUTION:
Do not heat components above 60°C (140°F).

If the incident occurs while heat testing the component, replace or properly insulate the component as needed.

Freezing Test

The customer may indicate the incident goes away after the vehicle warms up (winter time). The cause could be related to water freezing somewhere in the wiring/electrical system. There are two methods to check for this:

- The first method is to arrange for the owner to leave the vehicle overnight. Make sure it will get cold enough to duplicate the complaint. Leave the vehicle parked outside overnight. In the morning, do a quick and thorough diagnosis of those electrical components which could be affected.
- The second method is to put the suspect component into a freezer long enough for any water to freeze. Reinstall the part on the vehicle and check for a reoccurrence of the incident. If it occurs, repair or replace the component as needed.

Water Intrusion Test

The incident may occur only during high humidity or in rainy/snowy weather. In such cases the incident could be caused by water intrusion on an electrical part. This can be simulated by soaking the car or running it through a car wash.

Electrical Load Test

The incident may be electrical load sensitive. Perform diagnosis with all accessories (including A/C, rear window defogger, radio, fog lamps) turned on.

Cold or Hot Starting Test

On some occasions an electrical incident may occur only when the vehicle is started cold, or it may occur when the vehicle is restarted hot shortly after being turned off. In these cases you may have to keep the vehicle overnight to make a proper diagnosis.

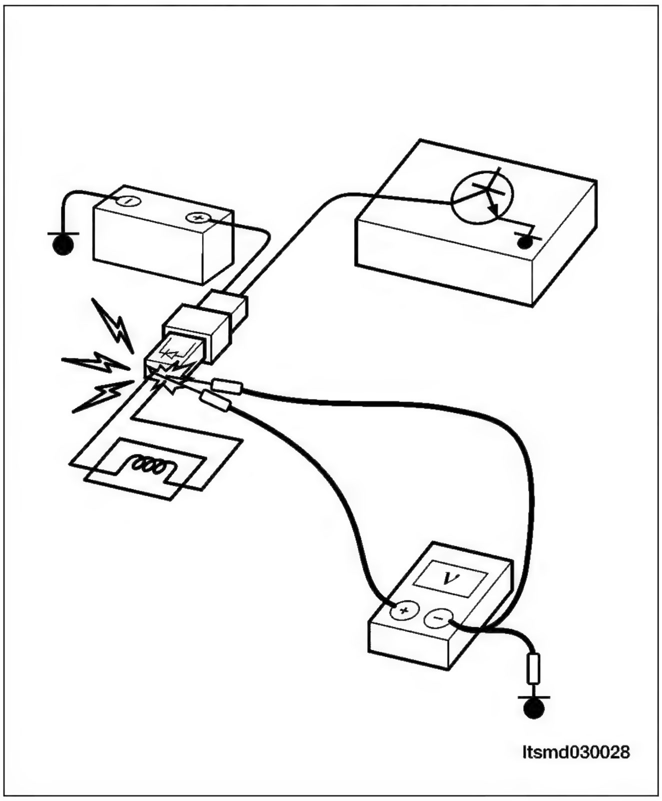
Voltage Drop Test

Voltage drop tests are often used to find components or circuits which have excessive resistance. A voltage drop in a circuit is caused by a resistance in the circuit during operation.

- Check the circuit using a Digital Multimeter (DMM).
- When measuring resistance with a DMM, remember that contact by a single strand of wire will give a reading of 0 ohms. This would indicate a good circuit. When the circuit operates, this single strand of wire is not able to carry the current. The single strand will have a high resistance to the current. This will be indicated as a slight voltage drop.
- Unwanted resistance can be caused by the following:
  - Undersized wiring (single strand example)
  - Corrosion on switch contacts
  - Loose wire connections or splices

Precautions For Handling Control Modules and Electrical Components

- Never reverse polarity of battery terminals.
- Only install components specified for the vehicle.
- Before replacing the control module, check the input and output and functions of the components.
- When disconnecting components:
  - Do not apply excessive force when disconnecting a connector.
  - If a connector is installed by tightening bolts, loosen mounting bolt, then remove it by hand.
- When connecting components:
  - Before installing a connector, make sure the terminal is not bent or damaged, and then correctly connect it.
  - When installing a connector by tightening bolts, tighten the mounting bolt until the painted area of the connector becomes even with the surface.
- Do not apply excessive shock to the control module by dropping or hitting it.
- Be careful to prevent condensation in the control module due to rapid temperature changes and do not let water or rain get on it. If water is found in the control unit, dry it fully and then install it in the vehicle.
- Be careful not to let oil get on the control module connector.
- Avoid cleaning the control module with volatile oil.
- When using a DMM, be careful not to let the test probes touch each other causing a short circuit. Prevent the power transistor in the control module from being shorted to damaging battery voltage.
- When checking input and output signals of the control module, use the specified test adapter (if applicable).



How To Check Electrical Connectors

Many electrical problems are caused by faulty electrical connections or wiring. It is also possible for a sticking component or relay to cause a problem. Before condemning a component or wiring assembly always check the electrical connectors for good continuity.

How To Probe Connectors

- Connector damage and an intermittent connection can result from improperly probing the connector during circuit checks.
- The probe of a DMM may not correctly fit the connector cavity. To correctly probe the connector, follow the procedures below using a “T” pin. For the best contact grasp the “T” pin using an alligator clip.

Probing From Harness Side

- If the connector has a rear cover connector, remove the rear cover before probing the terminal.
- Do not probe waterproof connectors from the harness side. Damage to the seal between the wire and connector may result.

Probing From Terminal Side

- Female Terminal:
  - Do not insert any object into the female connector that is bigger than the male terminal.
- Male Terminal:
  - Carefully probe the contact surface of each terminal using a “T” pin. Do not bend terminal.

How To Check Proper Contact Spring Tension Of Terminal

- An enlarged contact spring of a terminal may create intermittent signals in the circuit.
- If an intermittent open circuit occurs, follow the procedure below to inspect for open wires and enlarged contact spring of female terminal.
  - Use a male terminal which matches the female terminal.
  - Disconnect the suspected faulty connector and hold it terminal side up.
  - While holding the wire of the male terminal, attempt to insert the male terminal into the female terminal.
  - While moving the connector, check whether the male terminal can be easily inserted or not.

NOTE :
If the male terminal can be easily inserted into the female terminal, replace the female terminal.

ELECTRICAL INFORMATION

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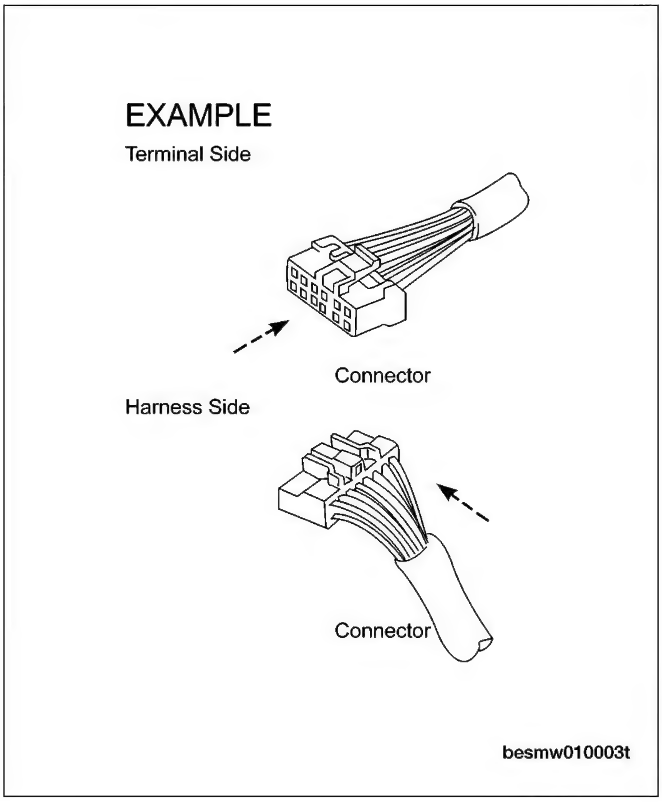
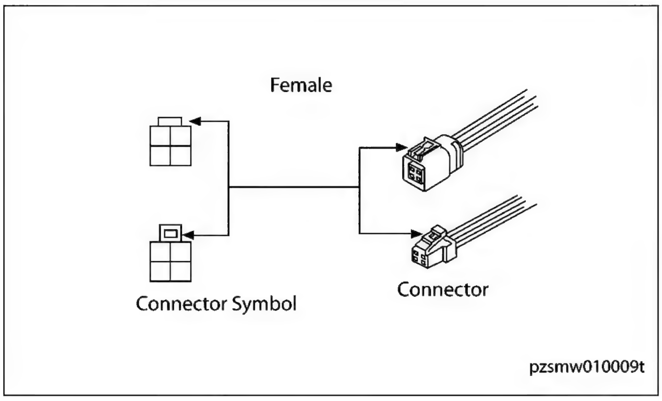
HOW TO READ ELECTRICAL SCHEMATICS

Connector Symbols

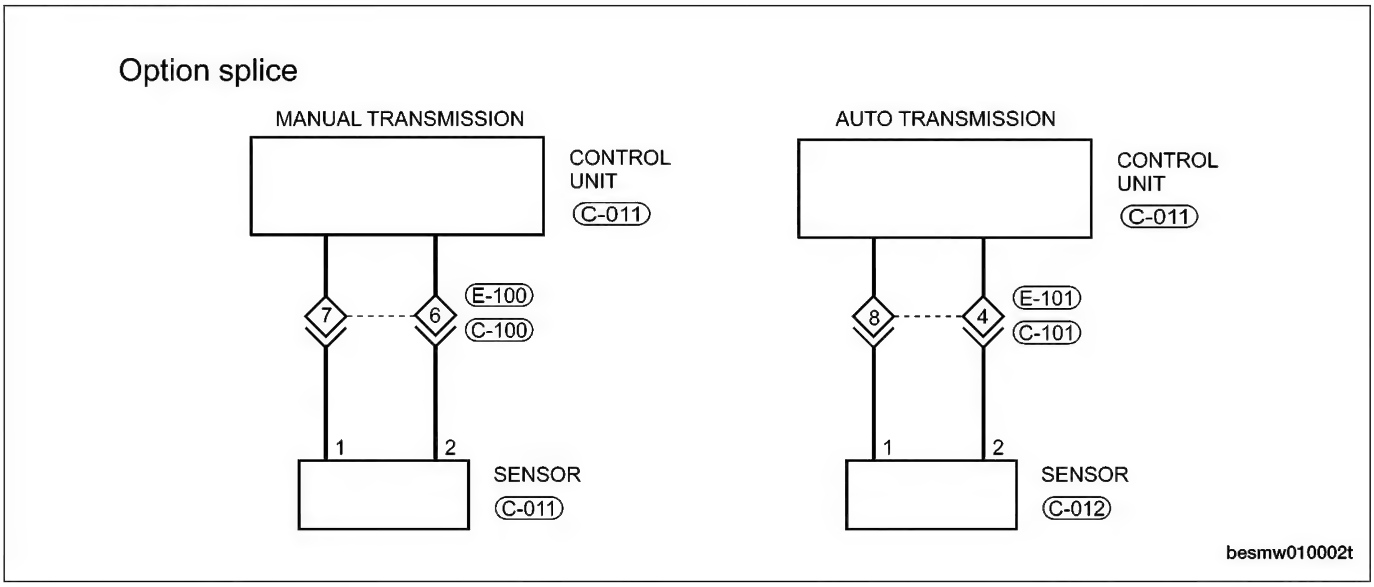
- Connector symbols shown from the terminal side are enclosed by a single line and followed by the direction mark.
- Connector symbols shown from the harness side are enclosed by a double line and followed by the direction mark.
- Most of the connector symbols in the electrical schematics are shown from the terminal side.


EXAMPLE
Terminal Side
Connector
Harness Side
Connector
besmw010003t

- In electrical schematics, female terminal end views are shown at the bottom of the page for all components that are shown on the schematic page.

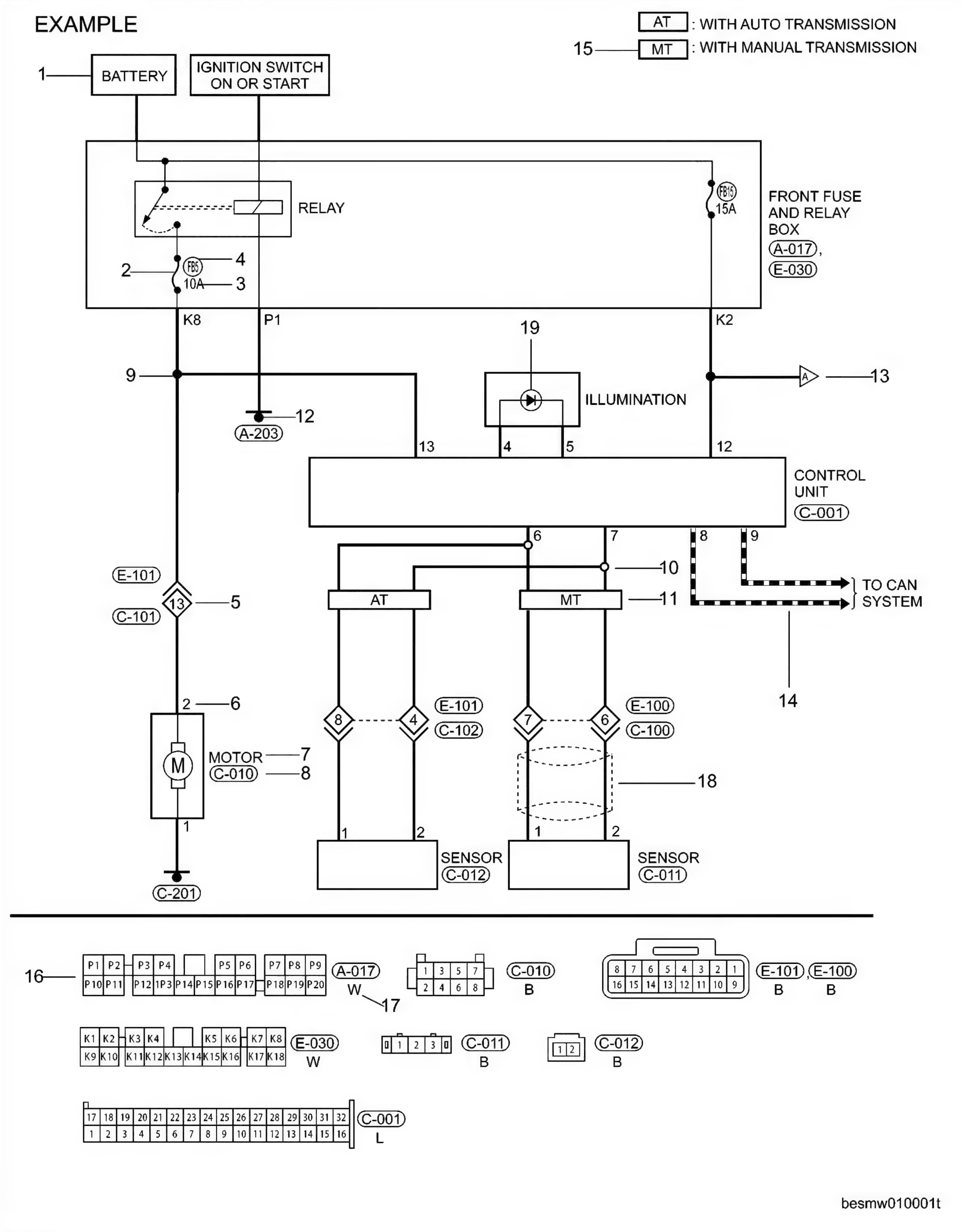

Female
Connector Symbol
Connector
pzsmw010009t

Option Splices


Option splice
MANUAL TRANSMISSION
CONTROL UNIT
C-011
7
6
E-100
C-100
1
2
SENSOR
C-011
AUTO TRANSMISSION
CONTROL UNIT
C-011
8
4
E-101
C-101
1
2
SENSOR
C-012
besmw010002t

- Option splices are shown with solid squared boxes with identification numbers inside.

Electrical Schematic - Example


EXAMPLE
AT : WITH AUTO TRANSMISSION
15 MT : WITH MANUAL TRANSMISSION
1 BATTERY
IGNITION SWITCH ON OR START
RELAY
FB15 15A
FRONT FUSE AND RELAY BOX
A-017,
E-030
2
FB5 10A
4
3
K8
P1
K2
19
9
12
A-203
ILLUMINATION
13
13
4
5
12
CONTROL UNIT
C-001
6
7
8
9
10
11
AT
MT
TO CAN SYSTEM
14
E-101
13
5
C-101
2 6
MOTOR 7
C-010 8
M
1
C-201
8
4
E-101
C-102
7
6
E-100
C-100
18
1
2
SENSOR
C-012
1
2
SENSOR
C-011
16
P1 P2 P3 P4 P5 P6 P7 P8 P9
P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20
A-017
W
17
1 3 5 7
2 4 6 8
C-010
B
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
E-101, E-100
B B
K1 K2 K3 K4 K5 K6 K7 K8
K9 K10 K11 K12 K13 K14 K15 K16 K17 K18
E-030
W
1 2 3
C-011
B
1 2
C-012
B
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-001
L
besmw010001t

HOW TO READ ELECTRICAL SCHEMATICS

Below is a list of the symbols and their definitions that are used in the electrical schematics.

NUMBER	ITEM	DESCRIPTION
1	Power source	This represents the condition when the system receives battery positive voltage.
2	Fuse	The single line represents that this is a fuse.
3	Current rating	This represents the current rating of the fuse.
4	Fuse location	This represents the location of the fuse in the Power Fuse Box or Front Fuse and Relay Box.
5	Connectors	This represents connector E-101 is female and connector C-101 is male.
6	Terminal number	This represents the terminal number of a connector.
7	Component name	This represents the name of a component.
8	Connector number	This represents the connector number. The letter represents which harness the connector is located in.
9	Splice	The shaded circle represents that the splice is always on the vehicle.
10	Optional splice	The open circle represents that the splice is optional depending on vehicle application.
11	Option abbreviation	This represents that the circuit is optional depending on vehicle application.
12	Ground (GND)	This represents the ground connection. (See Ground Distribution in Section 16 Wiring). Ground connector number has no view face.
13	Page crossing	This arrow represents that the circuit continues to an adjacent page. The ″A″ corresponds with the ″A″ on the adjoining page of the electrical schematic.
14	Data link	This represents that the system branches to another system identified by cell data code.
15	Option description	This represents a description of the option abbreviation used on the page.
16	Connector views	This represents the connector information. This component side is described by the connector symbols.
17	Connector color	This shows a code for the color of the connector: B = Black W = White R = Red G = Green L = Blue Y = Yellow BR = Brown O = Orange GR = Gray
18	Shielded line	The line enclosed by broken line circle represents shielded wire.
19	Light-emitting diodes	As an illumination tool, in the circuit and instrument cluster.

HOW TO LOCATE ELECTRICAL SCHEMATICS IN THE SERVICE MANUAL

Electrical Schematic Index

The following table shows where to locate a specific electrical schematic for a vehicle component or system. The electrical schematics are found throughout the service manual and are easily identified by their components or vehicle systems.

NOTE :
Some service manual chapters DO NOT contain electrical schematics, and will be identified as **None** in the Component/Vehicle System column.

SERVICE MANUAL CHAPTER	COMPONENT / VEHICLE SYSTEM
01 - General Information	• None
02 - Engine	• None
03 - Electronic Engine Controls	• Engine Control Module (ECM) • Engine Coolant Temperature Sensor • Knock Sensor • Upstream Oxygen Sensor • Downstream Oxygen Sensor • Crankshaft Position Sensor • Camshaft Position Sensor • Ignition Coil • Canister Control Valve • Front Fuse and Relay Box • A/C Compressor • Fuel Level Sensor and Fuel Pump • Fuel Injectors • A/C Pressure Switch • Brake Switch • Vehicle Speed Sensor • Throttle Pedal Position Sensor • Power Steering Switch • Clutch Pedal Switch • Electronic Throttle Control Actuator • Manifold Absolute Pressure Sensor • Vehicle Speed Sensor
04 - Fuel Delivery	• Fuel Injectors • Fuel Level Sensor and Fuel Pump
05 - Starting & Charging	• Starter Motor • Ignition Switch • Clutch Pedal Switch • Generator
06 - Cooling System	• Cooling Fan

SERVICE MANUAL CHAPTER	COMPONENT / VEHICLE SYSTEM
07 - Exhaust	• None
08 - Transmission	• Backup Lamp Switch • Clutch Solenoid Valve • Gear Engagement Solenoid Valve • Gearshift Selection Solenoid Valve • Engagement Position Sensor • Gearshift Selection Sensor • Hydraulic Pressure Sensor • Clutch Position Sensor
09 - Axle	• None
10 - Suspension	• None
11 - Steering	• Power Steering Switch
12 - Brakes	• Antilock Brake System (ABS) Module • Wheel Speed Sensors • Brake Switch • Parking Brake Switch • Brake Fluid Level Switch • Brake Pad Wear Sensor
13 - Heating & Air Conditioning	• Manual Temperature Control System • Blower Motor • A/C Compressor • A/C Pressure Switch
14 - Restraints	• Restraints Control Module • Seatbelt Buckle Switch • Driver Airbag • Passenger Airbag

SERVICE MANUAL CHAPTER	COMPONENT / VEHICLE SYSTEM
15 - Body & Accessories	• Windshield Wiper Motor • Windshield Washer Motor • Rear Window Defroster • Power Door Locks • Power Windows • Power Mirrors • Sonar Module • Radio • Interior Lights • Exterior Lights • Siren • Body Control Module (BCM) • Trunk Opening Switch • Trunk Release Solenoid • Instrument Cluster • Key Switch • Power Outlet • Data Link Connector • Horn • Immobilizer Control Module
16 - Wiring	• Power Distribution • Front Fuse and Relay Box • Power Fuse Box • Ignition Switch • Ground Distribution

Abbreviation List

TERM	ABBREVIATION
Antilock Brake System	ABS
Accelerator Sensor	AES
Accelerator Pedal Position Sensor	APPS
Automated Manual Transaxle	AMT
Body Control Module	BCM
Brake Pressure Sensor	BPS
Camshaft Position Sensor	CMP Sensor
Clutch Pedal Position Switch	CPP Switch
Crankshaft Position Sensor	CKP Sensor
Data Link Connector	DLC
Diagnostic Trouble Code	DTC
Engine Control Module	ECM
Engine Coolant Temperature Sensor	ECT Sensor
Engine Speed	RPM
Evaporative Emission	EVAP
Evaporative Emission Canister	EVAP Canister
Evaporative Emission System	EVAP System
Front Left Wheel Speed Sensor	FLS
Front Right Wheel Speed Sensor	FRS

TERM	ABBREVIATION
Rear Left Wheel Speed Sensor	RCS
Rear Right Wheel Speed Sensor	RRS
Ground	GND
Heated Oxygen Sensor	O2S
Idle Air Control	IAC
Ignition	IGN
Ignition Control	IC
Injector	INJ
Input Shaft Speed Sensor	ISS Sensor
Immobilizer Control Module	ICM
Knock Sensor	KS
Manifold Absolute Pressure Sensor	MAP Sensor
Malfunction Indicator Lamp	MIL
Oil Pressure Switch	OPS
Output Shaft Speed Sensor	OSS Sensor
Positive Crankcase Ventilation Valve	PCV Valve
Power Supply	PWR
SRS Airbag Control System	SRC
Throttle Position Sensor	TPS
Vehicle Identification Number	VIN
Vehicle Speed Sensor	VSS

ENGINE
02

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1.3L ENGINE MECHANICAL

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GENERAL INFORMATION

Description

The 1.3L in-line four cylinder engine has the following features:
- Double overhead camshafts
- Four valves per cylinder
- Aluminum cylinder head
- Cast iron cylinder block

Operation

The 1.3L engine utilizes 4 valve-per-cylinder and a double overhead camshaft design. The engine uses an individual coil ignition system. The cylinder block is made of cast iron and the bearing caps are integrated into the lower cylinder block assembly. An aluminum oil pan bolts to the bottom of the lower cylinder block. The camshafts are mounted in the cylinder head and act against valve tappets to open and close the valves. The camshafts are driven off the front of the cylinder head by one timing belt. The belt is driven by a sprocket that is located on the crankshaft. The piston assembly is an aluminum piston with a cast iron connecting rod.

The aluminum cylinder head contains double overhead camshafts with four valves per cylinder. The valves are arranged in two in-line banks. The cylinder head incorporates powdered metal valve guides and seats. The cylinder head is sealed to the block using a multi-layer steel head gasket and retaining bolts.

Specifications

1.3L Engine Specifications

DESCRIPTION	SPECIFICATION
Type	In-Line OHV, DOHC
Number of Cylinders	4
Compression Ratio	10.0:1
Compression Pressure	10.0 - 13.5 bar
Max. Compression Pressure Variation Between Cylinders	30%
Stroke	77.5 mm
Cylinder Volume	1.297 L
Bore	73 mm
Fuel Designation (Not less than)	#93
Engine Oil Quantity	3.5 L
Fuel Supply Mode	Multi-Point Electronic Controlled Gasoline Injection
Engine Oil Designation	SAE 10W-40 (Grade SL or above)
Displacement	1297 cc
Firing Order	1-3-4-2

Mechanical Specifications

DESCRIPTION	ITEM	STANDARD	LIMIT
Engine Oil Pressure	Lower Idle Speed (800 ± 50 RPM)	1.2 - 1.5 bar	-
	High Idle Speed (2000 RPM)	3.2 - 3.5 bar	-
	High Speed (4000 RPM)	3.7 ± 0.5 bar	-
Engine Block Clearance	Surface Distortion	-	0.15 mm
	Inner Diameter	73.005 ± 0.005 mm	-
	Out-Of-Round	-	Less than 0.008 mm
	Taper	-	Less than 0.01 mm
Piston Ring Groove Clearance	First Ring	0.035 - 0.08 mm	-
	Second Ring	0.025 - 0.07 mm	-
Piston To Piston Pin Clearance	-	0.013 - 0.018 mm	-
Piston Diameter	-	72.965 ± 0.009 mm	-
Connecting Rod Radial Clearance	-	0.023 - 0.058 mm	-
Connecting Rod Axial Clearance	-	0.15 - 0.4 mm	-
Diameter Of Crankshaft Main Journals	-	46.01 mm	-
Diameter Of Crankshaft Rod Journals	-	44.485 - 44.495 mm	-
Out-Of-Round Maximum Of Crankshaft Main Journals	-	-	Less than 0.008 mm
Axial Clearance Of Crankshaft	-	0.02 - 0.30 mm	-
Radial Clearance Of Crankshaft	-	0.0035 - 0.034 mm	-
Coaxality Crankshaft Main Journal	-	-	Less than 0.005 mm
Thrust Washer Thickness	-	2.4 - 2.405 mm	-
Oil Clearance Of Crankshaft Rod And Main Journals	-	0.02 mm	0.06 mm
Cylinder Head Flatness	-	0.05 - 0.10 mm	-
Intake Valve Deflection	-	-	Less than 0.02 mm
Exhaust Valve Deflection	-	-	Less than 0.04 mm
Spring Height	-	49.0 mm	-
Spring Height At 620 Newtons Of Pressure	-	32.0 mm	-
Intake Cam Lobe Height	-	37.09 mm	-
Exhaust Cam Lobe Height	-	37.05 mm	-
Camshaft Journal #1 Outer Diameter	-	31.934 - 31.95 mm	-
Camshaft Journal #2, #3, #4, #5, Outer Diameter	-	23.947 - 23.96 mm	-

DESCRIPTION	ITEM	STANDARD	LIMIT
Camshaft Cam Bearing #1 Inner Diameter	-	32 - 32.025 mm	-
Camshaft Cam Bearing #2, #3, #4, #5, Inner Diameter	-	24 - 24.021 mm	-
Camshaft Journal #1 Clearance	-	0.05 - 0.090 mm	-
Camshaft Journal #2, #3, #4, #5 Clearance	-	0.04 - 0.074 mm	-
Intake Camshaft Axial Clearance	-	0.15 - 0.20 mm	-
Exhaust Camshaft Axial Clearance	-	0.15 - 0.20 mm	-
Intake Valve Guide Clearance	-	0.012 - 0.043 mm	-
Exhaust Valve Guide Clearance	-	0.032 - 0.063 mm	-
Valve Outer Diameter	Intake Valve	5.98 ± 0.008 mm	-
	Exhaust Valve	5.96 ± 0.008 mm	-
Valve Guide Inner Diameter	Intake Valve	5.4 ± 0.1 mm	-
	Exhaust Valve	5.4 ± 0.1 mm	-
Fringe Thickness On Top Of Valve	Intake Valve	0.3 ± 0.15 mm	-
	Exhaust Valve	0.3 ± 0.15 mm	-
Valve Tilt Angle	Intake Valve	65°	-
	Exhaust Valve	68°	-
Valve Height	Intake Valve	107.998 mm	-
	Exhaust Valve	106.318 mm	-

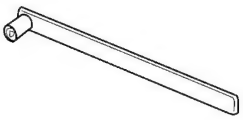
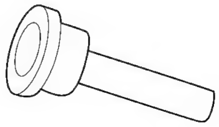
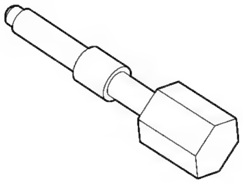
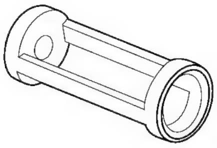
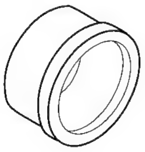
Torque Specifications

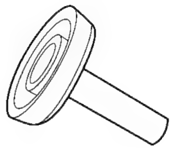
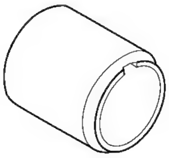
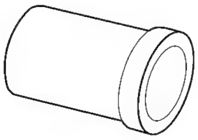
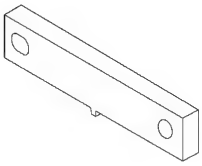
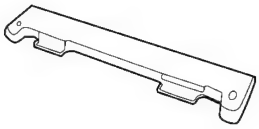
CAUTION:
When torquing a fastener in two steps, DO NOT use a torque wrench for the second step.

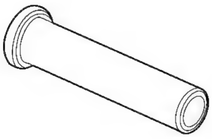
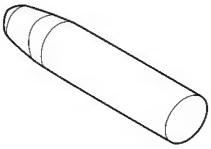
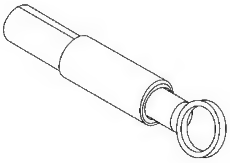
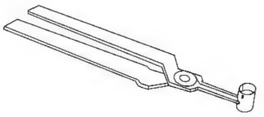
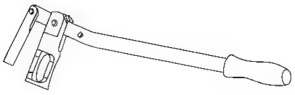
DESCRIPTION	TORQUE (N·m)
A/C Compressor Line Bolt	20 ± 5
Camshaft Bearing Cap Bolts	9.5 ± 1.5
Clutch Pressure Plate Bolts	25 ± 5
Connecting Rod Cap Bolts	1st Step: Tighten the bolt to 25 ± 3 N·m 2nd Step: Tighten the bolt an additional 90 ± 5°
Crankshaft Holder	28
Crankshaft Main Bearing Cap Bolts	1st Step: Tighten the bolt to 45 ± 5 N·m 2nd Step: Tighten the bolt an additional 180 ± 10°
Crankshaft Timing Belt Pulley Bolt	1st Step: Tighten the bolt to 130 ± 10 N·m 2nd Step: Tighten the bolt an additional 65 ± 5°
Crankshaft Vibration Damper Bolts	25 ± 5 2nd Step: Tighten the bolt an additional 30 ± 5°
Camshaft Timing Belt Pulley Bolt	120 ± 5
Cylinder Head Cover Bolts	10 ± 2

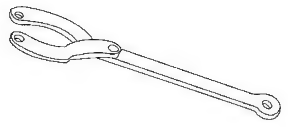
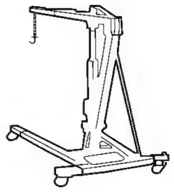
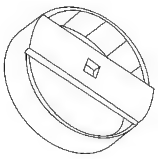
DESCRIPTION	TORQUE (N·m)
Cylinder Head Bolts	1st Step: Tighten the bolt to 50 ± 5 N·m 2nd Step: Tighten the bolt an additional 90 ± 5° 3rd Step: Tighten the bolt an additional 90 ± 5°
Dipstick Bracket Bolts	10 ± 2
Engine Left Mount Bolt	65 ± 5
Engine Right Mount Bolt	65 ± 5
Engine Front Mount Bolt	80 ± 5
Engine Rear Mount Bolt	60 ± 5
Engine To Transaxle Bolts	70 ± 5
Exhaust Manifold Nuts	20 ± 5
Exhaust Manifold To Catalytic Converter Bolts	60 ± 5
Exhaust Manifold Heat Shield Bolts	10 ± 5
Exhaust Camshaft Timing Belt Pulley Bolt	120 ± 5
Fuel Rail Bracket Bolts	10 ± 3
Flywheel Bolt	1st Step: Tighten the bolt to 15 ± 5 N·m 2nd Step: Tighten the bolt an additional 30 ± 5°
Idler Pulley Bolt	40 ± 5
Intake Camshaft Timing Belt Pulley Bolt	120 ± 5
Intake Manifold Bolts	8 ± 3
Intake Manifold Nuts	8 ± 3
Intake Manifold Bracket Bolts	20 ± 5
Lower Idler Pulley Bolt	40 ± 5
Lower Cylinder Block Bolts	25 ± 5
Oil Filter	25 ± 3
Oil Pan Bolts	15 ± 5
Oil Drain Plug	25 ± 3
Oil Strainer Bolts	18
Oil Pump Bolts	8 ± 3 (Apply with Loctite 5910 Thread-Locker)
Rear Timing Cover Bolts	8 ± 3
Timing Belt Upper Cover Bolts	8 ± 3
Timing Belt Lower Cover Bolts	8 ± 3
Timing Belt Tensioner Assembly	27 ± 3
Timing Belt Tensioner Pulley Bolt	45 ± 5
Shift Cable Bracket Bolts	25 ± 5
Throttle Body Bolts	8 ± 3
Upper Idler Pulley Bolt	45 ± 5

Special Tools

Right Engine Mount Bolt Remover CH-20001	 besm020079
Camshaft Seal Installer CH-20002	 besm020001
Crankshaft Holder CH-20003	 besm020009
Valve Spring Compressor Adaptor CH-20004	 besm020080
Rear Crankshaft Oil Seal Installer CH-20005	 besm020003

Rear Crankshaft Oil Seal Guide CH-20006	 besm020002
Front Crankshaft Seal Installer CH-20007	 besm020004
Front Crankshaft Seal Guide CH-20008	 besm020005
Flywheel Fixture CH-20009	 besm080040
Camshaft Holder CH-20010	 besm020008

Valve Seal Installer CH-20011	 besm020081
Valve Stem Seal Installer Guide CH-20012	 besm020006
Valve Seal Remover CH-20013	 besm020082
Valve Keeper Installer CH-20017	 besm020084
Valve Spring Compressor CH-20018	 besm020007

Crankshaft Belt Pulley Fixture CH-20019	
Engine Hoist	
Oil Filter Remover CH-10003	

Lubrication System

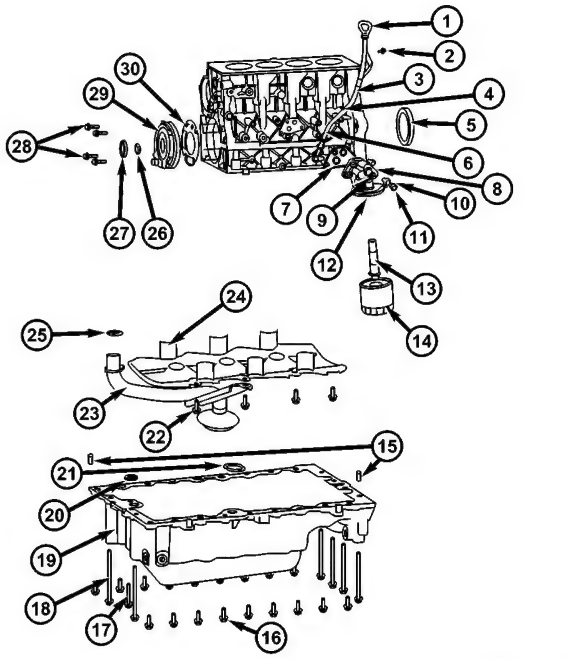
The engine lubrication system operates as follows:

- Oil is drawn into the oil pump through the oil pump strainer tube in the sump of the oil pan.
- Oil is pumped through the oil filter on the cylinder block.
- Oil enters the main oil gallery where it is distributed to the crankshaft main journals and to the cylinder head.
- From the main journals, the oil is routed through cross-drilled passages in the crankshaft to lubricate the connecting rod bearings. Controlled leakage through the crankshaft main bearings and connecting rod bearings is slung radially outward to cool and lubricate the cylinder walls as well as the entire connecting rod, piston and piston ring assembly.
- The engine lubrication system is a full-flow filtration, pressure feed type. The oil pump body is mounted to the engine block. The pump inner rotor is driven by the crankshaft.

Engine Oil Pressure Specifications

Idle Speed (950 ± 10 RPM)	2.7 Bar

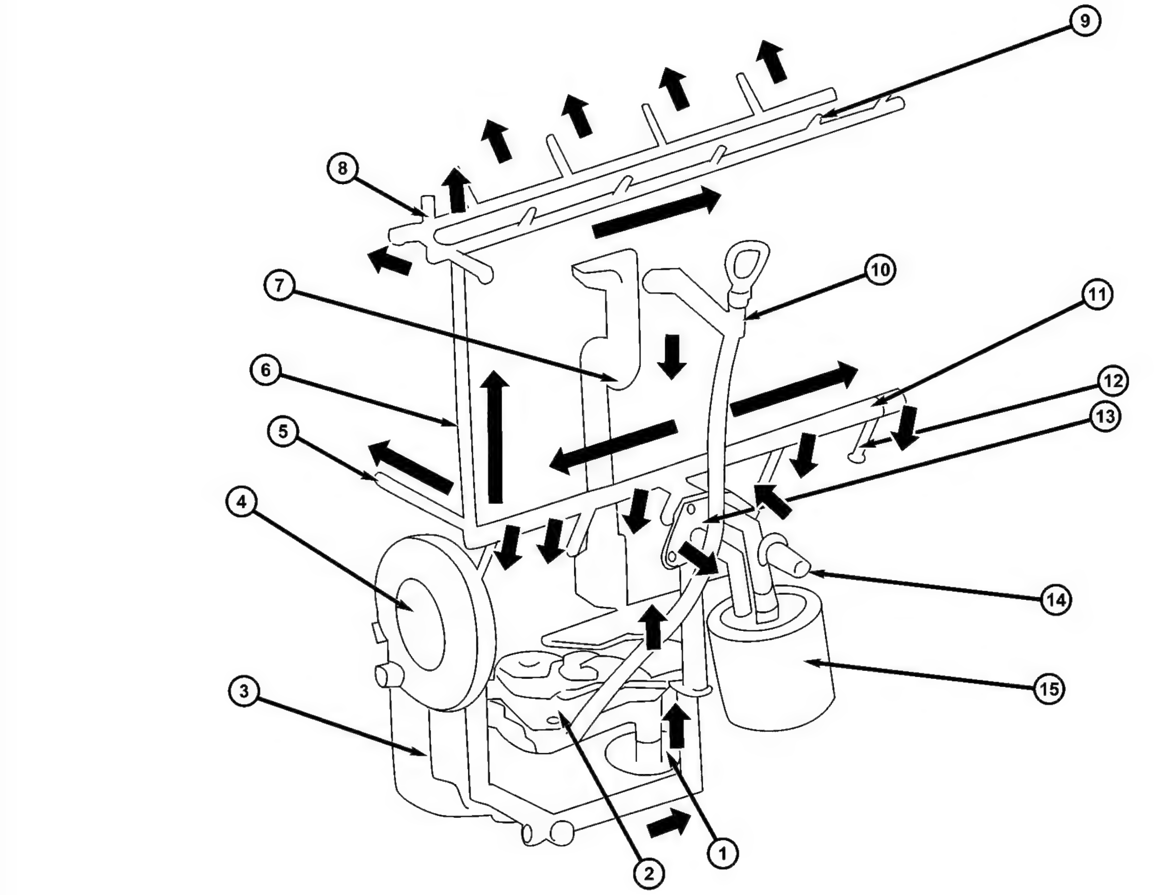
Engine Lubrication System Exploded View



pzsm020035

1 - Oil Dipstick	16 - Oil Pan Bolt
2 - Oil Dipstick Bolt	17 - Oil Pan Bolt
3 - Oil Dipstick Bracket	18 - Oil Pan Bolt
4 - Oil Dipstick Guide	19 - Oil Pan
5 - Crankshaft Rear Oil Seal	20 - O-Ring
6 - O-Ring	21 - O-Ring
7 - Oil Filter Bracket Gasket	22 - Oil Pump Strainer Bolt
8 - Oil Filter Bracket	23 - Oil Pump Strainer
9 - Pressure-relief Plunger	24 - Baffle Plate
10 - Flange Bolt	25 - O-Ring
11 - Flange Bolt	26 - O-Ring
12 - Oil Filter Seat	27 - Crankshaft Front Oil Seal
13 - Oil Filter Connector	28 - Oil Pump Bolt
14 - Oil Filter	29 - Oil Pump Assembly
15 - Dowel Pin	30 - Oil Pump Assembly Gasket

Engine Oil Flow Diagram



1 – Oil Pump Strainer	9 – To Middle Bearing Cap
2 – Baffle Plate	10 – Oil Dipstick
3 – Oil Pan	11 – To Crankcase
4 – Oil Pump	12 – Crankcase Pipe
5 – Turbocharger Inlet Oil Passage (if equipped)	13 – Oil Filter Bracket
6 – To Cylinder Head	14 – Oil Pressure Switch
7 – Oil Return Passage	15 – Oil Filter
8 – To Front Bearing Cap	

DIAGNOSIS & TESTING

Engine Performance Diagnostics

CONDITION	POSSIBLE CAUSE	CORRECTION
Engine Does Not Start	1. Weak battery. 2. Corroded or loose battery connections. 3. Faulty starter. 4. Faulty coil(s) or control unit. 5. Incorrect spark plug gap. 6. Contamination in fuel system. 7. Faulty fuel pump. 8. Incorrect timing.	1. Test battery. Charge or replace if necessary. 2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals. 3. Test starting system. Check for codes. (Refer to Appropriate Diagnostic Information) 4. Test and replace as needed. (Refer to Appropriate Diagnostic Information) 5. Set gap. 6. Clean system and replace fuel filter. 7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information) 8. Check for a skipped timing belt.
Engine Stalls Or Idles Rough	1. Idle speed too low. 2. Incorrect fuel mixture. 3. Intake manifold leakage. 4. Faulty ignition coil(s).	1. Test minimum air flow. (Refer to Appropriate Diagnostic Information) 2. (Refer to Appropriate Diagnostic Information) 3. Inspect intake manifold, manifold gasket, and vacuum hoses. 4. Test and replace if necessary. (Refer to Appropriate Diagnostic Information)
Engine Loss Of Power	1. Dirty or incorrectly gapped spark plugs. 2. Contamination in fuel system. 3. Faulty fuel pump. 4. Incorrect valve timing. 5. Leaking cylinder head gasket. 6. Low compression. 7. Burned, warped, excessive clearance or pitted valves. 8. Plugged or restricted exhaust system. 9. Faulty ignition coil(s). 10. Burned spark plugs.	1. Clean spark plugs and set gap. 2. Clean system and replace fuel filter. 3. Test and replace if necessary. (Refer to Appropriate Diagnostic Information) 4. Correct valve timing. 5. Replace cylinder head gasket. 6. Test compression of each cylinder. 7. Replace valves. 8. Perform exhaust restriction test. Install new parts. 9. Test and replace if necessary. (Refer to Appropriate Diagnostic Information) 10. Replace spark plugs.
Engine Miss On Acceleration	1. Dirty or incorrectly gapped spark plugs. 2. Contamination in fuel system. 3. Burned, warped, or pitted valves. 4. Faulty ignition coil(s).	1. Clean spark plugs and set gap. 2. Clean fuel system and replace fuel filter. 3. Replace valves. 4. Test and replace if necessary. (Refer to Appropriate Diagnostic Information)

CONDITION	POSSIBLE CAUSE	CORRECTION
Engine Miss At High Speed	1. Dirty or incorrect spark plug gap. 2. Faulty ignition coil(s). 3. Dirty fuel injector(s). 4. Contamination in fuel system.	1. Clean spark plugs and set gap. 2. Test and replace if necessary. (Refer to Appropriate Diagnostic Information) 3. Test and replace if necessary. (Refer to Appropriate Diagnostic Information) 4. Clean system and replace fuel filter.

Engine Mechanical Diagnostics

CONDITION	POSSIBLE CAUSE	CORRECTION
Valve Train Noise	1. High or low oil level in crankcase. 2. Thin or diluted oil. 3. Thick oil. 4. Low oil pressure. 5. Worn cam lobe. 6. Worn valve guides. 7. Excessive runout of valve seats on valve faces.	1. Check and correct engine oil level. 2. Change oil to correct viscosity. 3. Change engine oil and filter. 4. Check and correct engine oil level. 5. Install new camshaft. 6. Replace cylinder head. 7. Grind valve seats and replace valves.
Connecting Rod Noise	1. Insufficient oil supply. 2. Low oil pressure. 3. Thin or diluted oil. 4. Excessive bearing clearance. 5. Connecting rod journal out-of-round. 6. Connecting rod out-of-round. 7. Misaligned connecting rods. 8. Connecting rod nuts loose.	1. Check engine oil level. 2. Check engine oil level. Inspect oil pump relief valve and spring. 3. Change oil to correct viscosity. 4. Measure bearings for correct clearance. Repair if necessary. 5. Replace crankshaft or grind surface. 6. Replace connecting rod. 7. Replace bent connecting rods. 8. Tighten the connecting rod nuts.
Main Bearing Noise	1. Insufficient oil supply. 2. Low oil pressure. 3. Thin or diluted oil. 4. Excessive bearing clearance. 5. Excessive end play. 6. Crankshaft journal out-of-round or worn. 7. Loose flywheel or torque converter.	1. Check engine oil level. 2. Check engine oil level. Inspect oil pump. 3. Change oil to correct viscosity. 4. Measure bearings for correct clearance. Repair if necessary. 5. Check thrust bearing for wear on flanges. 6. Replace crankshaft or grind journals. 7. Tighten to correct torque.
Oil Pressure Drop	1. Low oil level. 2. Faulty oil pressure sending unit. 3. Low oil pressure. 4. Clogged oil filter. 5. Thin or diluted oil. 6. Excessive bearing clearance.	1. Check engine oil level. 2. Install new sending unit. 3. Check sending unit and main bearing oil clearance. 4. Install new oil filter. 5. Change oil to correct viscosity. 6. Measure bearings for correct clearance.

CONDITION	POSSIBLE CAUSE	CORRECTION
Oil Leaks	1. Misaligned or deteriorated gaskets. 2. Loose fastener, broken or porous metal part. 3. Misaligned or deteriorated cup or threaded plug.	1. Replace gasket. 2. Tighten, repair or replace the part. 3. Replace if necessary.
Oil Consumption Or Spark Plugs Fouled	1. PCV system malfunction. 2. Worn, scuffed or broken rings. 3. Carbon in oil ring slots. 4. Rings fitted too tightly in grooves. 5. Worn valve guide(s). 6. Valve stem seal(s) worn or damaged.	1. Check system and repair if necessary. 2. Hone cylinder bores. Install new rings. 3. Install new rings. 4. Remove rings and check grooves. If groove is not proper width, replace piston. 5. Replace cylinder head. 6. Replace seal(s).

Cylinder Compression Pressure Test

- The result of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.
- Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnostic purposes.
  - Check engine oil level and add oil if necessary.
  - Disconnect the spark plug wires.
  - Remove all spark plugs from engine (as spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc.).
  - Record cylinder number of each spark plug for future reference.
  - Disconnect fuel injector electrical connectors.
  - Be sure throttle blade is fully open during the compression check.
  - Insert compression pressure adaptor or the equivalent into each spark plug hole in cylinder head.
  - Crank engine until maximum pressure is reached on gauge. Record each cylinder pressure.
  - Compression should not be less than 900 kPa and not vary more than 30 percent from cylinder to cylinder.
  - If one or more cylinders have abnormally low compression pressures, repeat the compression test.
  - If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem with the cylinder in question.

NOTE :
The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.

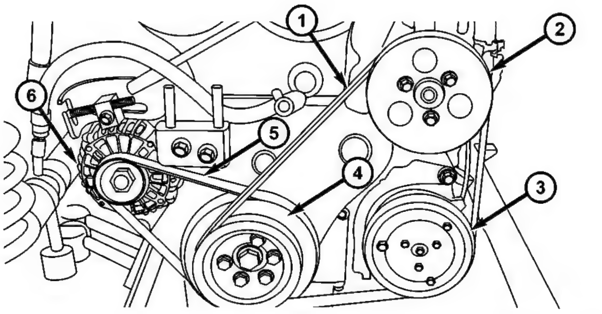
Cylinder Head Gasket Test

- A cylinder head gasket leak can be located between adjacent cylinders, between a cylinder and the adjacent water jacket or from an oil passage to the exterior of the engine.
- Possible indications of the cylinder head gasket leaking between adjacent cylinders are:
  - Loss of engine power
  - Engine misfiring
  - Poor fuel economy
- Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:
  - Engine overheating
  - Loss of coolant
  - Excessive steam (white smoke) emitting from exhaust
  - Coolant foaming

ON-VEHICLE SERVICE

Accessory Drive Belt

Removal & Installation



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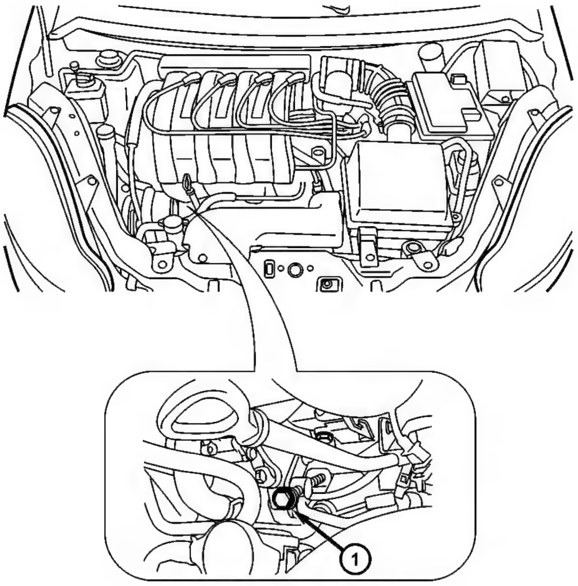
1 - A/C Compressor Belt	4 - Crankshaft Pulley
2 - Power Steering Pump	5 - Generator Belt
3 - A/C Compressor	6 - Generator

WARNING!
Inspect the drive belt only when the engine is stopped.

1. Loosen the power steering pump adjustment bolt (1).



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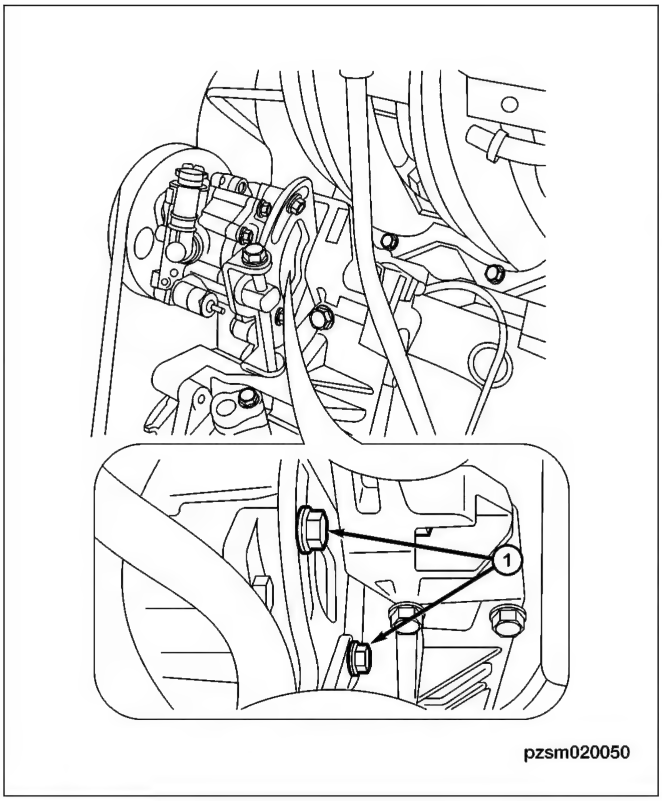
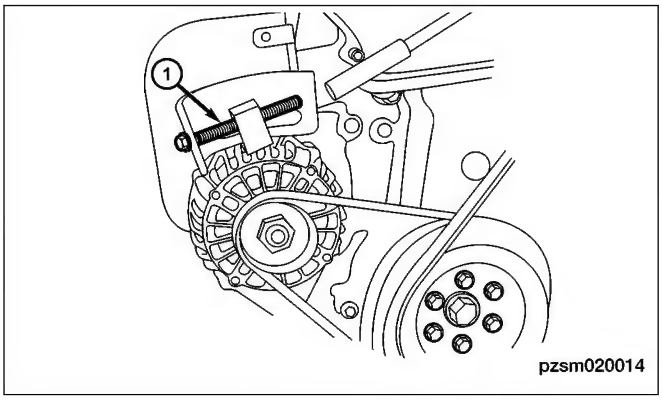
2. Loosen the two bolts (1) on the steering pump bracket.



3. Remove the A/C compressor belt.
4. Loosen the generator adjustment bolt (1).



5. Remove the generator belt.
6. Installation is in the reverse order of removal.

Installation Notes:

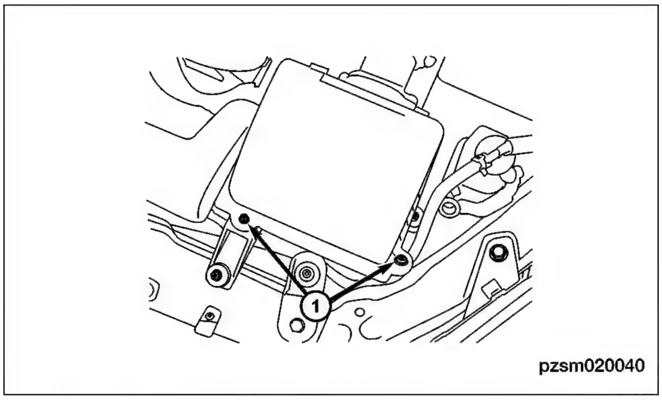
- Use a deflection gauge and adjust the drive belt tension to 95 N·m with a limit deflection of 5 mm.

NOTE :
Measure the drive belt deflection in the middle of the drive belt.

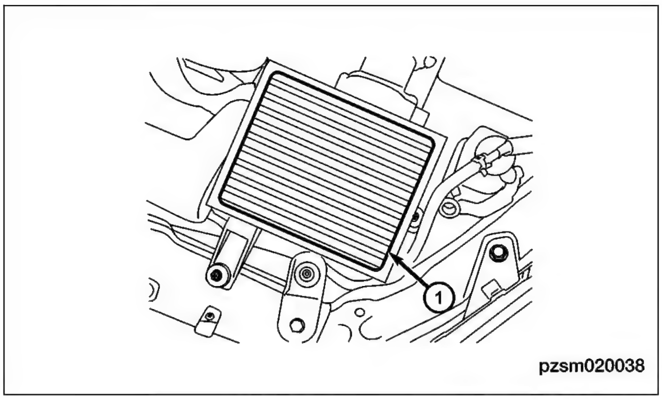
Air Cleaner Element

Removal & Installation

1. Remove the two air cleaner case side bolts (1) and remove the upper air cleaner case.



2. Remove the air cleaner element (1).
3. Install a new air cleaner element.

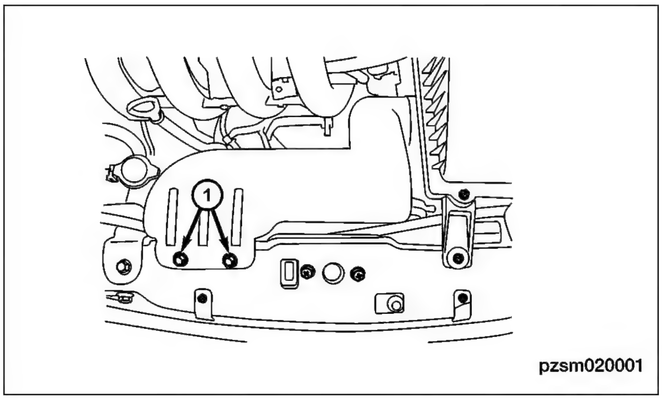


4. Installation is in the reverse order of removal.

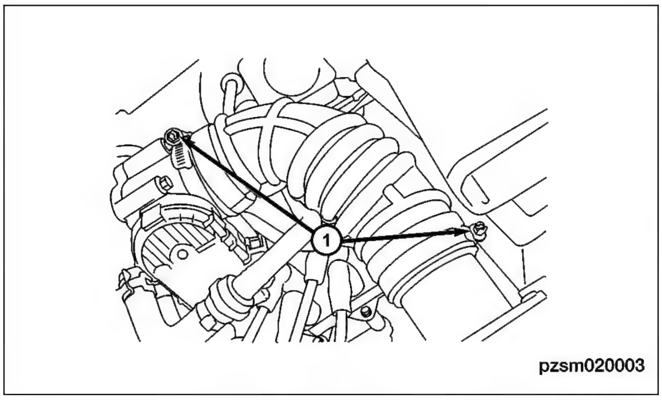
Air Cleaner Housing

Removal & Installation

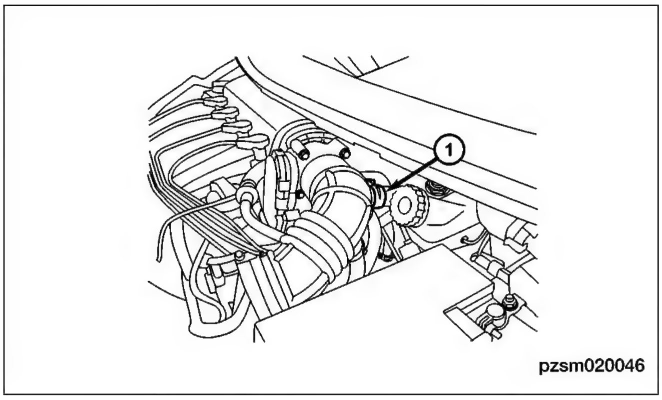
1. Remove the two retaining bolts (1) on the air intake pipe.
   (Tighten: Air intake pipe bolts to 8 ± 3 N·m)



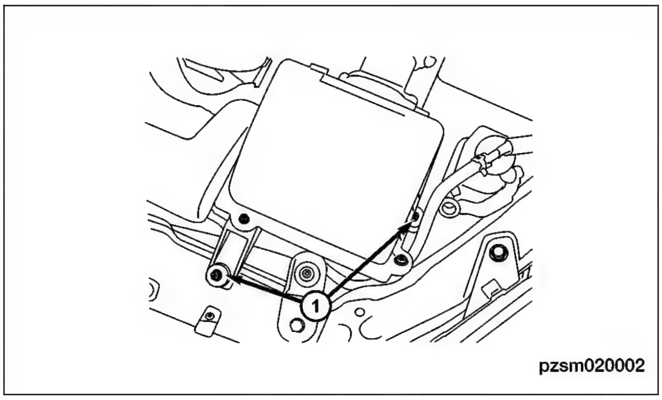
2. Remove the clamps (1) between the intake manifold and the air cleaner housing.



3. Remove the PCV return hose clamp (1) on the intake manifold hose.



4. Remove the intake manifold hose.
5. Remove the two air cleaner housing retaining bolts (1).
   (Tighten: Air cleaner housing bolts to 10 ± 5 N·m)



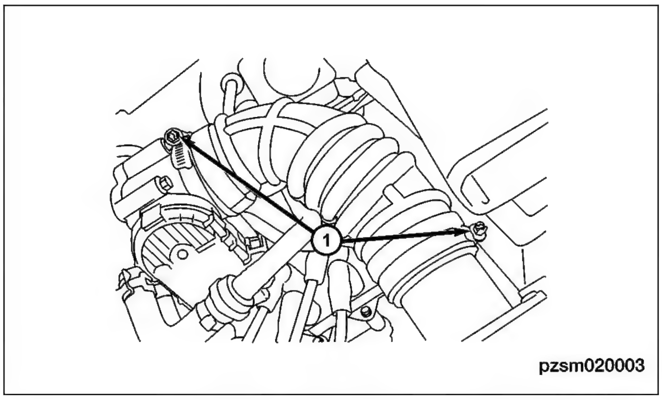
6. Remove the air cleaner housing.
7. Installation is in the reverse order of removal.

Cylinder Head Cover

Removal & Installation

1. Disconnect the negative battery cable.

2. Remove the clamps (1) between the intake manifold and the air cleaner housing.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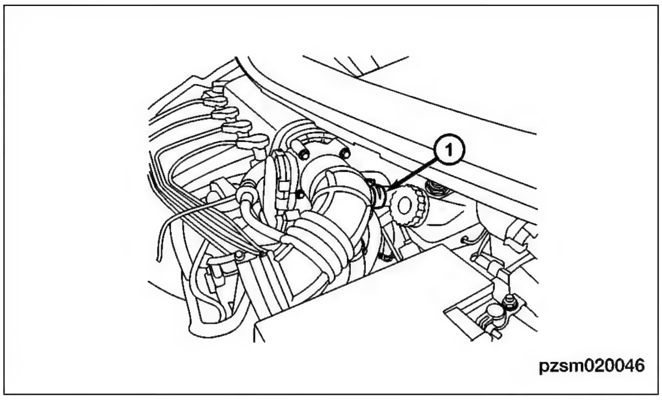
3. Remove the PCV return hose clamp (1) on the intake manifold hose.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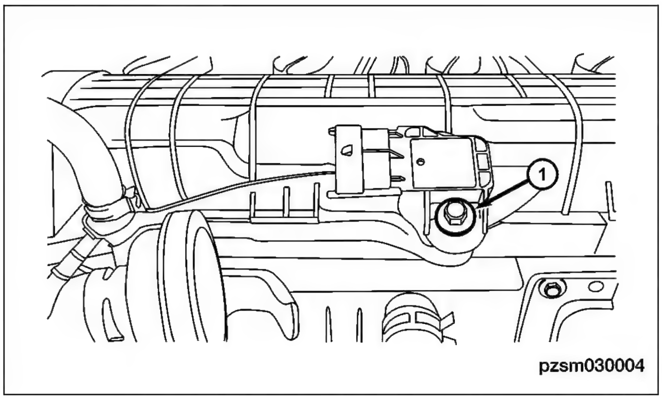
4. Remove the intake manifold hose.
5. Disconnect the manifold air pressure (MAP) sensor electrical connector.
6. Remove the MAP sensor retaining bolt (1) and remove the MAP sensor.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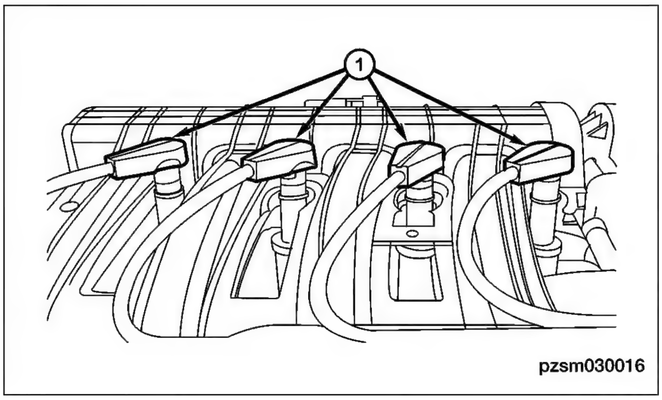
7. Remove the four spark plug wires (1) and set them aside.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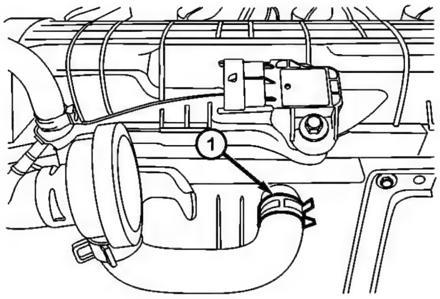
8. Remove the PCV hose clamp (1) and remove the PCV hose from the cylinder head cover.



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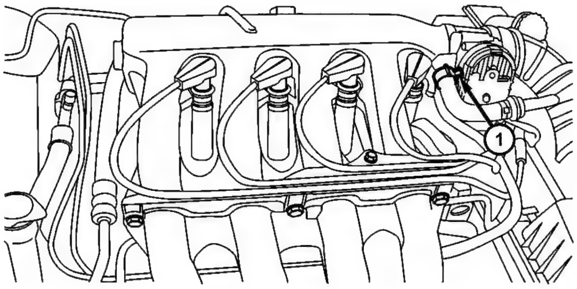
9. Remove the fuel vapor return hose clamp (1) and remove the fuel vapor return hose from the throttle body.



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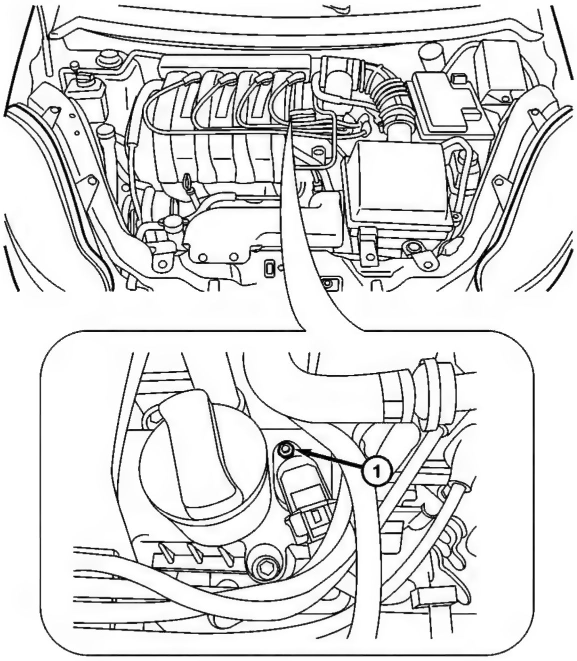
10. Disconnect the Camshaft Position (CMP) sensor electrical connector.
11. Remove the CMP sensor retaining bolt (1) and remove the CMP sensor.



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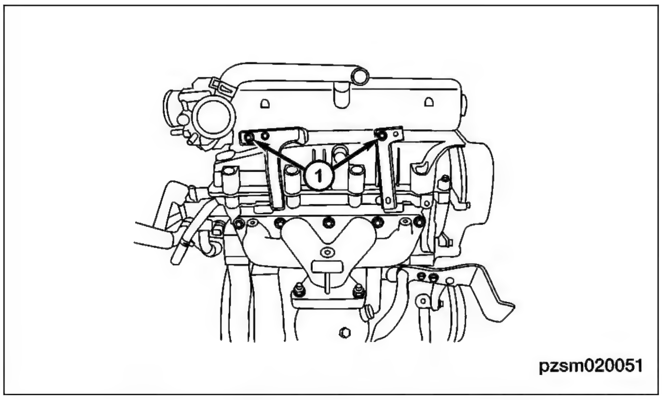
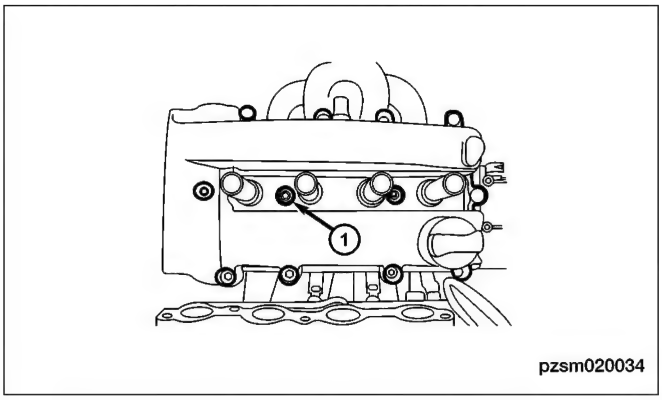
12. Remove the two intake manifold bracket retaining bolts (1).



13. Remove the intake manifold (See Intake manifold Removal & Installation in Section 02 Engine).
14. Remove the twelve cylinder head cover bolts (1). (Tighten: Cylinder head cover bolts to 10 ± 2 N·m)



15. Remove the cylinder head cover.
16. Installation is in the reverse order of removal.

Camshaft

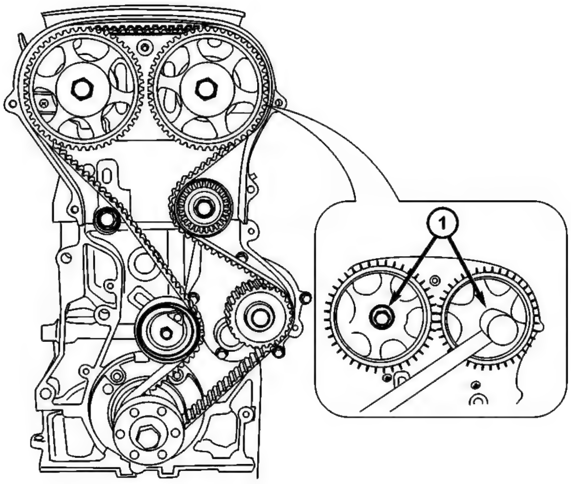
Removal & Installation

NOTE :
The following special tools are required to perform the repair procedure:

- CH-20002 - Camshaft Seal Installer
- CH-20010 - Camshaft Holder

1. Remove the accessory drive belt (See Accessory Drive Belt Removal & Installation in Section 02 Engine).
2. Remove the engine timing belt (See Engine Timing Belt Removal & Installation in Section 02 Engine).
3. Remove the cylinder head cover (See Cylinder Head Cover Removal & Installation in Section 02 Engine).

4. Remove the intake and exhaust camshaft timing belt pulley bolts (1).
   (Tighten: Camshaft timing belt pulley bolt to 120 ± 5 N·m)



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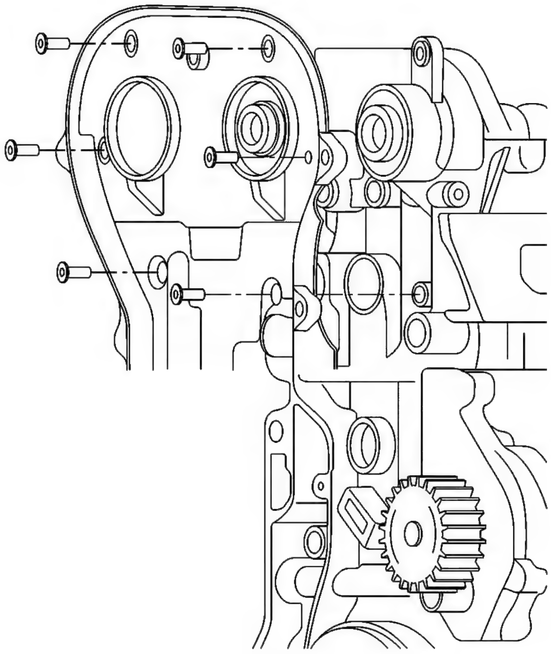
5. Remove the six rear timing cover bolts.
   (Tighten: Rear timing cover bolts to 10 ± 2 N·m)



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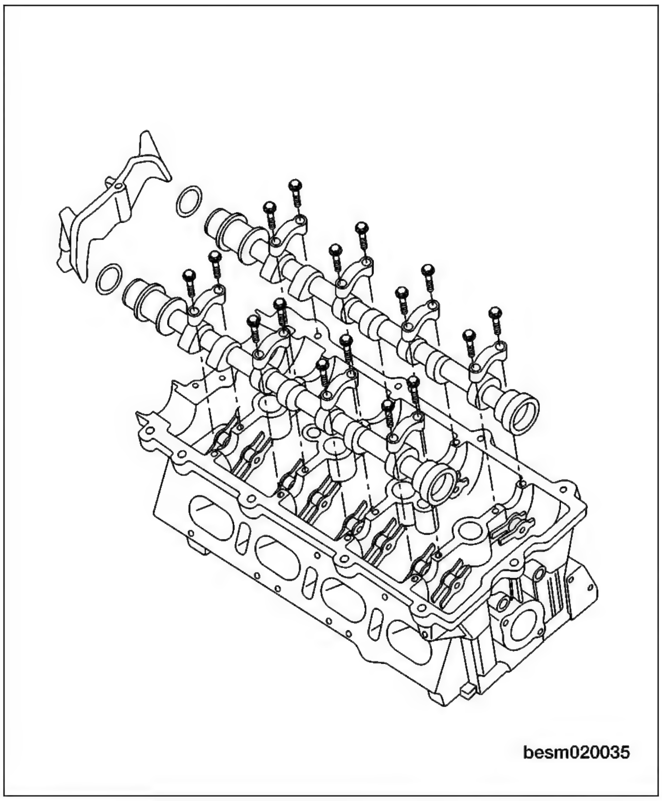
6. Remove the sixteen camshaft bearing cap bolts. (Tighten: Camshaft bearing cap bolts to 9.5 ± 1.5 N·m)

   NOTE: Equally loosen camshaft bearing cap bolts in several steps.
7. Remove the camshaft bearing caps and place them in proper order.

   NOTE: The camshaft bearing caps are marked for identification.
8. Remove the camshafts and then remove the camshaft seals.

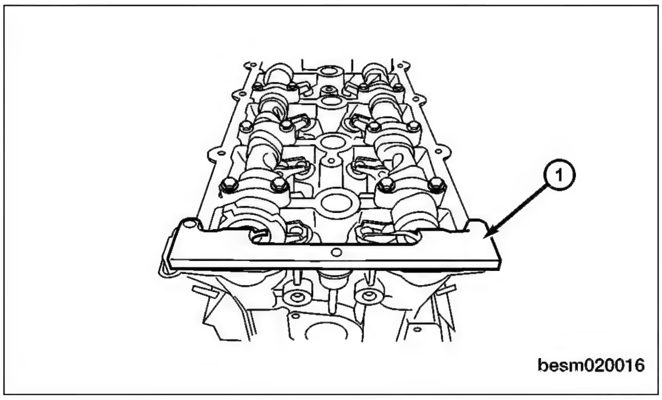


9. Installation is in the reverse order of removal.

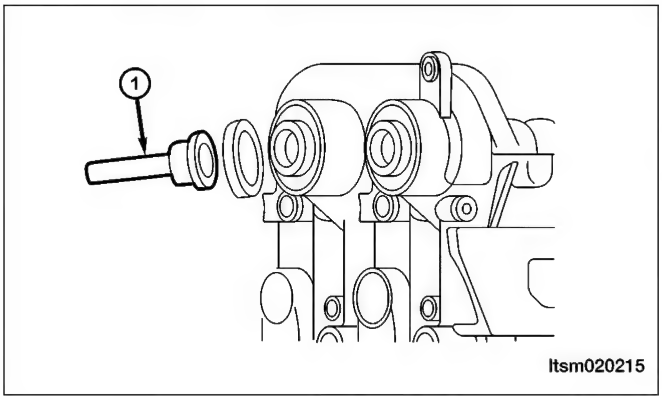
Installation Notes:

- Identify and separate the intake camshaft and the exhaust camshaft (the intake camshaft is identified by the gear on the end of the camshaft).
- Pay attention to the division mark of the camshaft shell cover.
- Use special tool CH-20010 (1), and install the camshaft holder to hold the camshafts in place.

NOTE :
The camshaft holder will prevent the camshafts from rotating in either direction.



- Use special tool CH-20002 (1), to install the camshaft seal.
- Install the camshaft seal in the required location and depth.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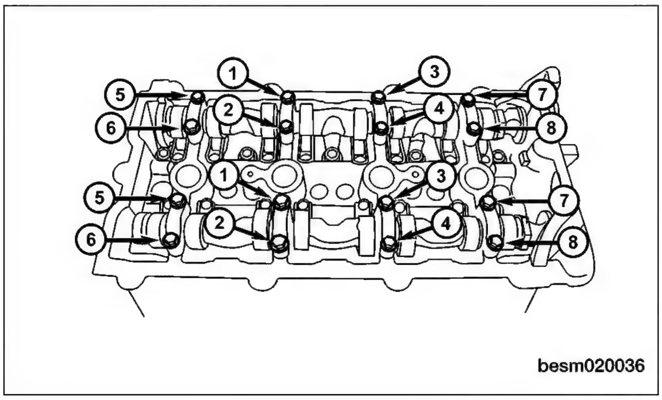
- Install the intake and exhaust camshaft bearing caps in the proper order.
- Slowly tighten bolts to the specified torque.
- Follow the torque sequence as shown.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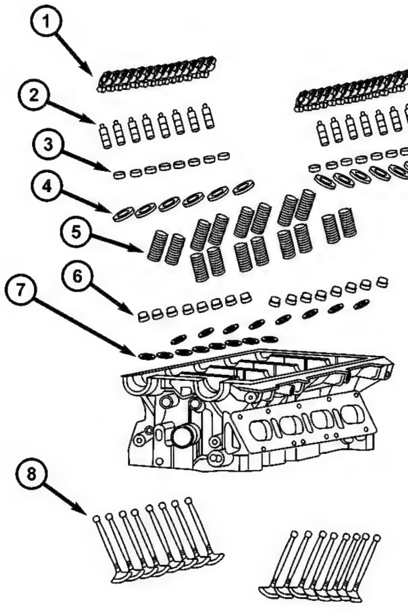
Cylinder Head

Removal & Installation

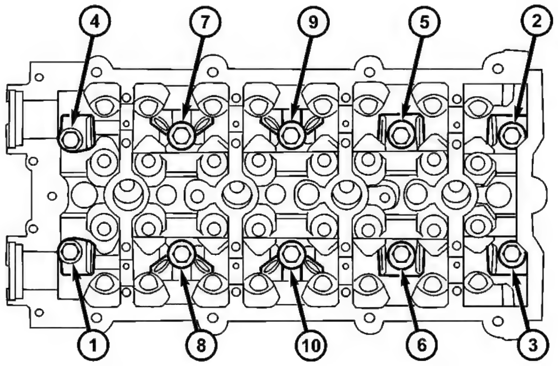


1 - Rocker Arms	5 - Valve Springs
2 - Hydraulic Tappets	6 - Valve Oil Seals
3 - Valve Keepers	7 - Valve Spring Lower Retainers
4 - Valve Spring Upper Retainers	8 - Valves

NOTE :
Replacement cylinder head comes complete with valves, seals, springs, retainers, keepers, and camshafts.

1. Remove the engine timing belt (See Engine Timing Belt Removal & Installation in Section 02 Engine).
2. Remove the cylinder head cover (See Cylinder Head Cover Removal & Installation in Section 02 Engine).
3. Remove the camshafts (See Camshaft Removal & Installation in Section 02 Engine).
4. Remove intake manifold (See Intake Manifold Removal & Installation in Section 02 Engine).
5. Remove exhaust manifold (See Exhaust Manifold Removal & Installation in Section 02 Engine).
6. Remove water pipe and thermostat assembly.

7. Remove the ten cylinder head bolts in the order shown.



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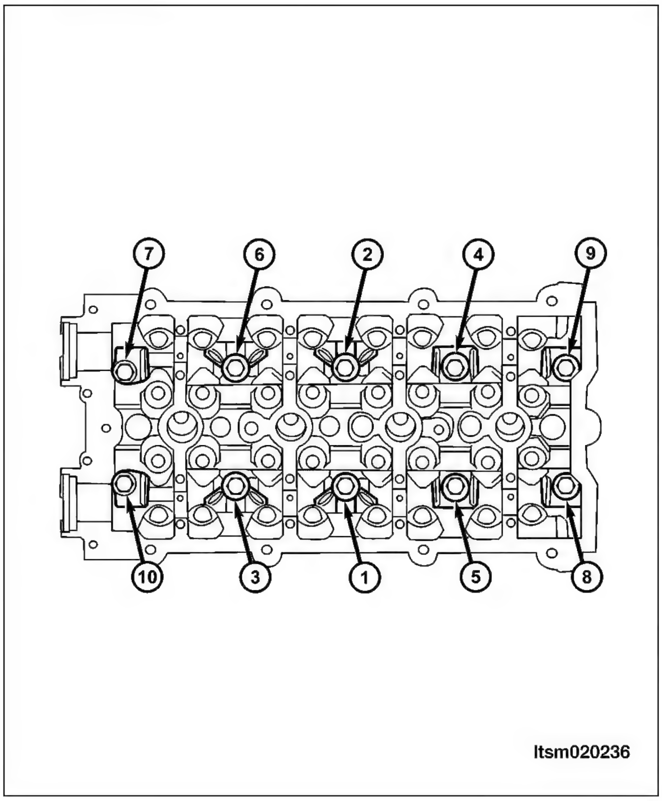
8. Remove cylinder head gasket.
9. Installation is in the reverse order of removal.

Installation Notes:

- Ensure the cylinder head bolt holes in the block are clean, dry (free of residual oil or coolant), and threads are not damaged.
- The cylinder head bolts should not be reused. The new bolts should be examined before use. If the bolts are stretched, the bolts should be replaced.
- Position the new cylinder head gasket on the engine block with the part number facing up. Ensure gasket is seated over the locating dowels in the block.
- Before installing the bolts, the threads should be lightly coated with engine oil.

- Install the ten cylinder head bolts in the order shown.
- Torque the cylinder head bolts in the following three step sequence:
  - 1st Step: Tighten the bolt to 50 ± 5 N·m
  - 2nd Step: Tighten the bolt an additional 90 ± 5°
  - 3rd Step: Tighten the bolt an additional 90 ± 5°



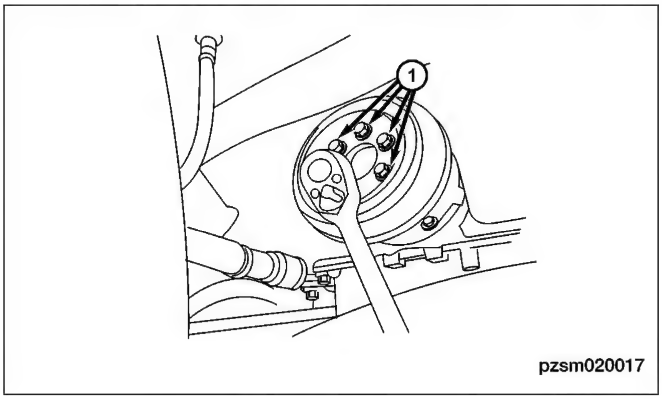
Front Crankshaft Oil Seal

Removal & Installation

NOTE :
The following special tools are required to perform the repair procedure:

- CH-20007 - Front Crankshaft Seal Installer
- CH-20008 - Front Crankshaft Seal Guide

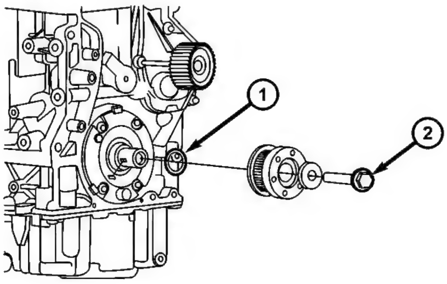
1. Remove the accessory drive belt (See Accessory Drive Belt Removal & Installation in Section 02 Engine).
2. Remove the six crankshaft vibration damper bolts (1).
   (Tighten: Crankshaft vibration damper bolts to 25 ± 5 N·m and an additional 30 ± 5°)



3. Remove the engine timing belt (See Engine Timing Belt Removal & Installation in Section 02 Engine).

4. Remove the crankshaft timing belt pulley bolt (2) from the crankshaft.
   (Tighten: Crankshaft timing belt pulley bolt to 130 ± 10 N·m and an additional 65 ± 5°)
5. Remove the key-way from the crankshaft.
6. Use an appropriate tool and remove the front crankshaft oil seal (1).

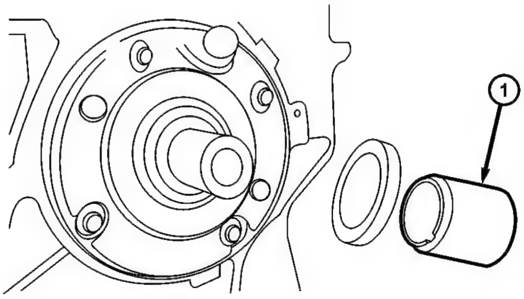
CAUTION:
Be careful not to damage the front cover seal surface while removing the seal.



7. Installation is in the reverse order of removal.

Installation Notes:

- Use the front crankshaft seal installer CH-20007 (1), to install the new seal.
- Lubricate the new front seal with engine oil prior to assembly.



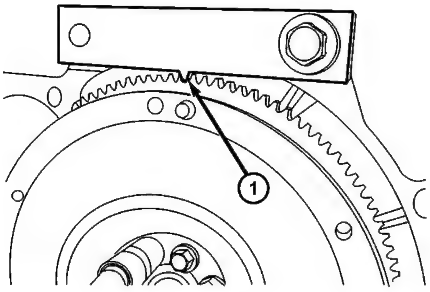
Rear Crankshaft Oil Seal

Removal & Installation

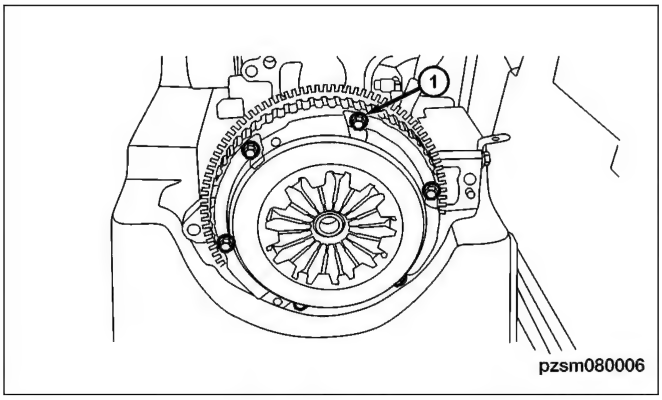
NOTE :
The following special tools are required to perform the repair procedure:

- CH-20005 - Rear Crankshaft Oil Seal Installer
- CH-20006 - Rear Crankshaft Oil Seal Guide
- CH-20043 - Flywheel Fixture

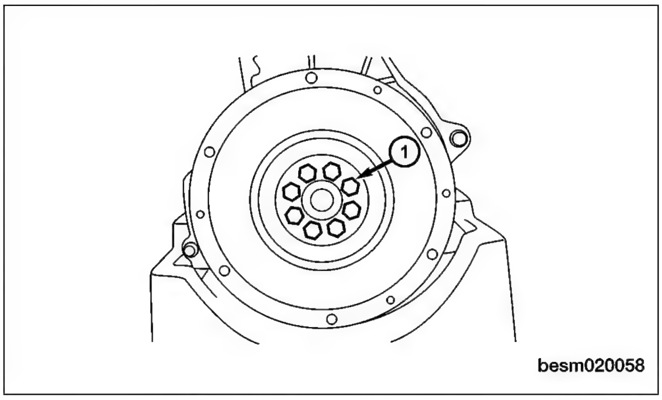
1. Remove the transaxle assembly (See Transaxle Assembly Removal & Installation in Section 08 Transaxle).
2. Using special tool CH-20043 (1), hold the flywheel.



3. Remove the six clutch pressure plate retaining bolts (1).
   (Tighten: Clutch pressure plate bolts to 25 ± 5 N·m)

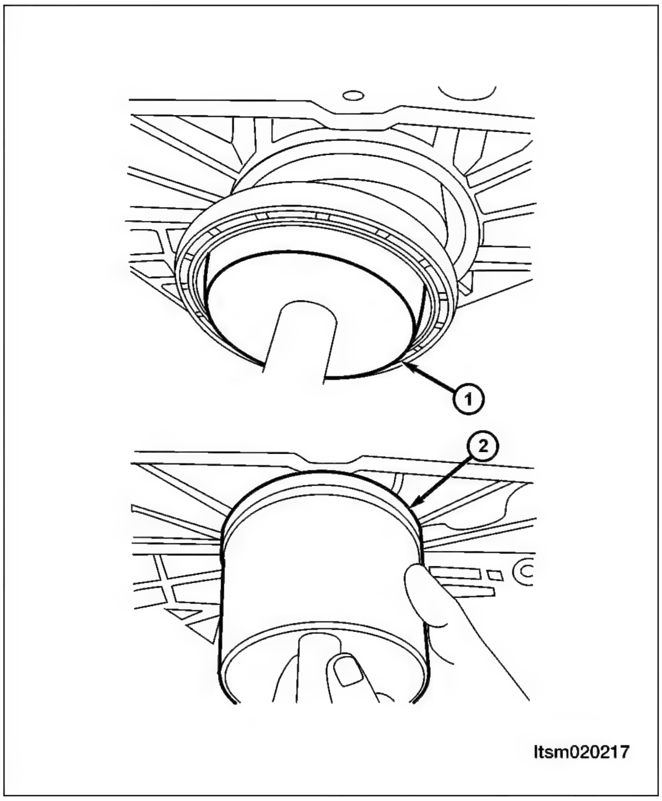


4. Remove the eight flywheel bolts (1) and then remove the flywheel.
   (Tighten: Flywheel bolts to 15 ± 5 N·m and an additional 30 ± 5°)
5. Remove the rear oil seal using a suitable tool.
6. Installation is in the reverse order of removal.



Installation Notes:

- When installing seal, lubricate seal guide with clean engine oil.
- Position the seal over the rear crankshaft seal guide.
- Use special tool CH-20005 (2) and CH-20006 (1), to install the rear crankshaft oil seal.
- Ensure that the lip of the seal is facing toward the crankcase during installation.



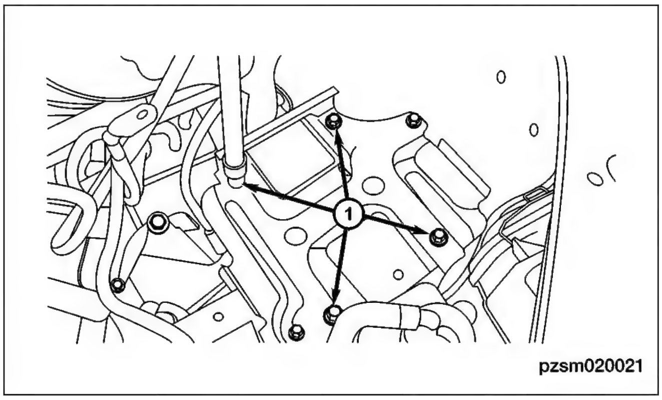
Engine Mounts

Removal & Installation - Left Mount

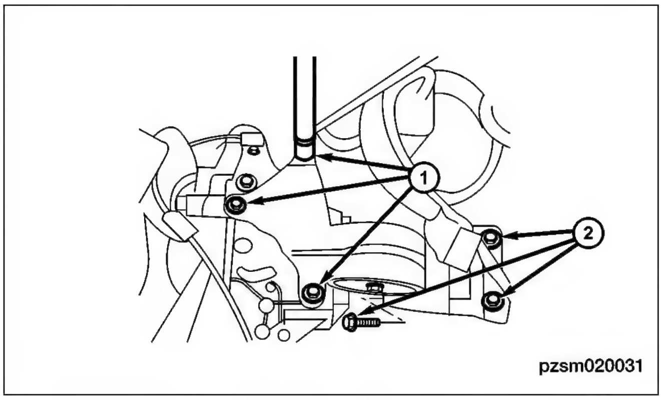
NOTE :
The following special tools are required to perform the repair procedure:

- Engine Hoist

1. Disconnect the negative battery cable.
2. Remove the battery (See Battery Removal & Installation in Section 05 Starting & Charging).
3. Remove the air cleaner housing (See Air Cleaner Housing Removal & Installation in Section 02 Engine).
4. Remove the four battery tray retaining bolts (1).



5. Remove the three left transaxle mount bolts (2) and the three left transaxle mount bracket bolts (1). (Tighten: Engine left mount bolt to 65 ± 5 N·m)
6. Installation is in the reverse order of removal.



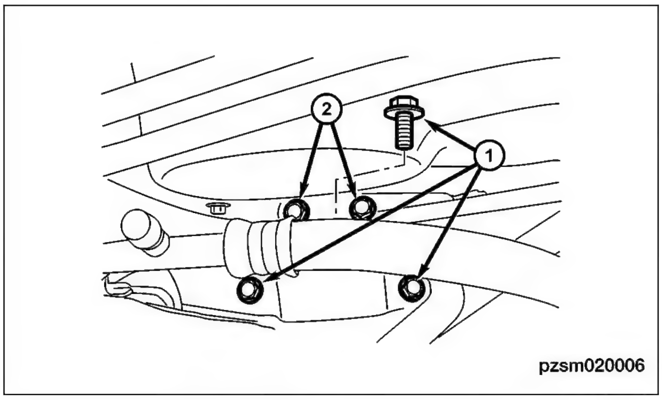
Removal & Installation - Right Mount

NOTE :
The following special tools are required to perform the repair procedure:

- Engine Hoist

1. Use the engine hoist to support the engine.

2. Remove the two right engine mount bolts (1) and the three right engine mount bracket bolts (2). (Tighten: Engine right mount bolt to 65 ± 5 N·m)
3. Installation is in the reverse order of removal.

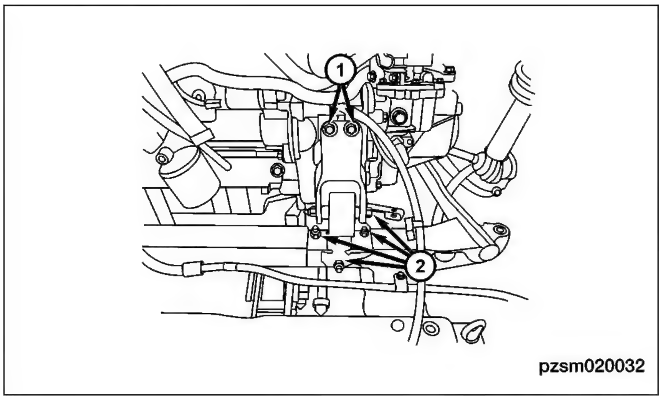


Removal & Installation - Front Mount

NOTE :
The following special tools are required to perform the repair procedure:

- Engine Hoist

1. Use the engine hoist to support the engine.
2. Remove the two front engine mount bolts (1) and the four front engine mount bracket bolts (2). (Tighten: Engine front mount bolt to 80 ± 5 N·m)



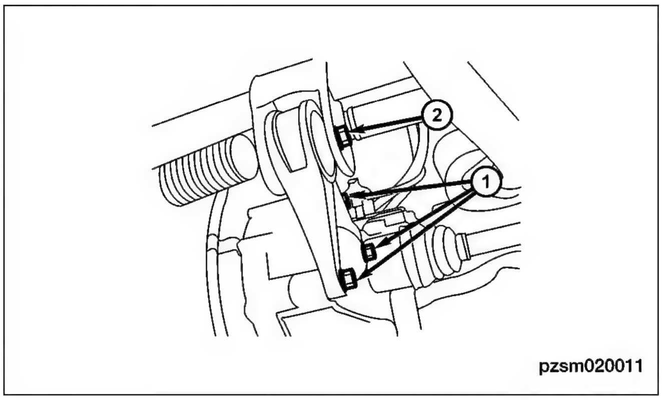
3. Installation is in the reverse order of removal.

Removal & Installation - Rear Mount

NOTE :
The following special tools are required to perform the repair procedure:

- Engine Hoist

1. Raise and support the vehicle.
2. Remove the rear engine mount retaining bolts (2) and the three rear engine mount bracket bolts (1). (Tighten: Engine rear mount bolt to 60 ± 5 N·m)



3. Installation is in the reverse order of removal.

Engine Assembly

Removal & Installation

NOTE :
The following special tools are required to perform the repair procedure:

- CH-20001 - Right Engine Mount Bolt Remover
- Engine Hoist

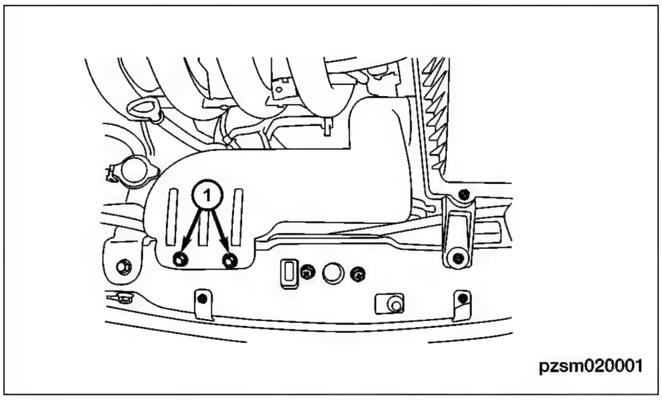
NOTE :
The engine is removed with the transaxle as an assembly.

1. Remove the vehicle hood.
2. Relieve the fuel pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
3. Remove the battery and battery tray (See Battery Removal & Installation in Section 05 Starting & Charging).
4. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).
5. Drain the cooling system (See Cooling System Draining and Filling in Section 06 Cooling).

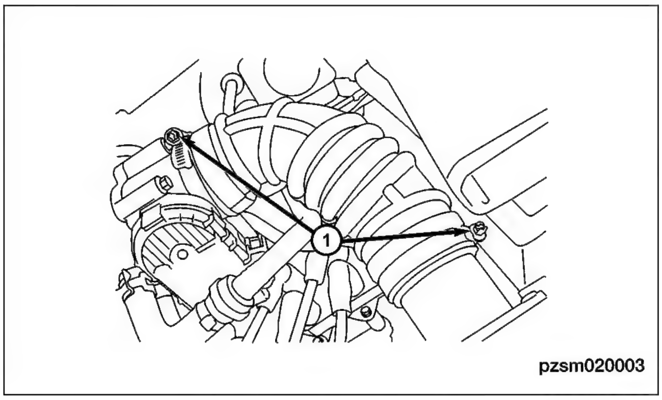
WARNING!

Always allow the engine to cool before opening the cooling system. Do not loosen the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

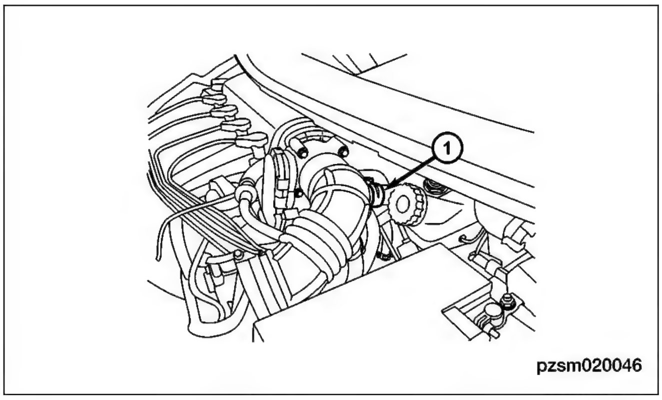
6. Remove the coolant fan & radiator assembly (See Coolant Fan & Radiator Assembly Removal & Installation in Section 06 Cooling).
7. Remove the negative battery cable from the engine.
8. Remove the two retaining bolts (1) on the air intake pipe.
   (Tighten: Air intake pipe bolts to 8 ± 3 N·m)



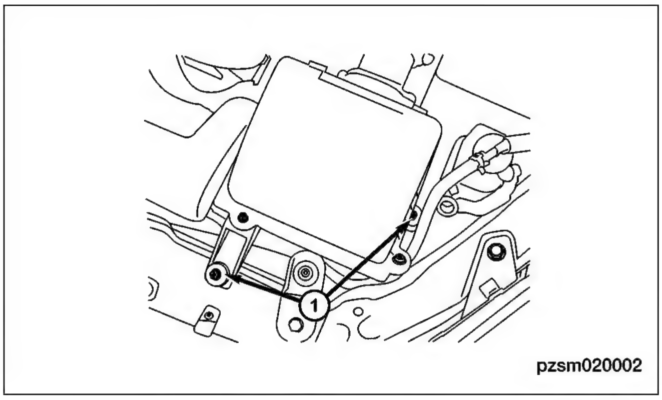
9. Remove the clamps (1) between the intake manifold and the air cleaner housing.
10. Remove the intake manifold hose.



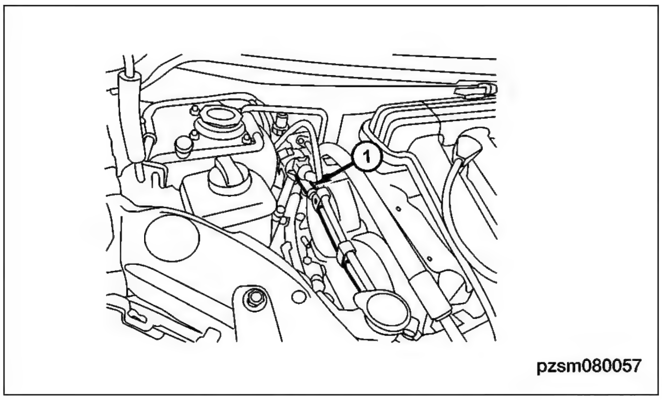
11. Remove the PCV return hose clamp (1) on the intake manifold hose.



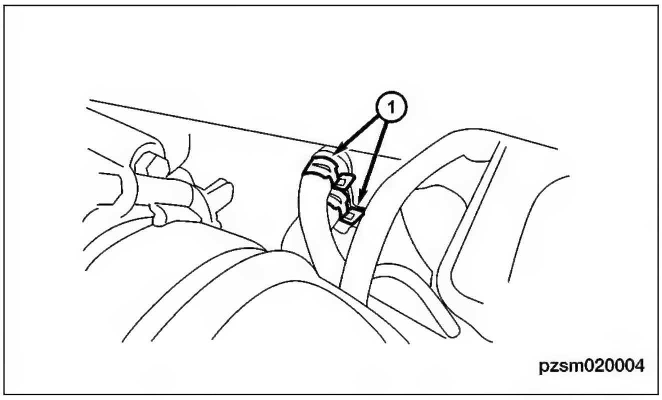
12. Remove the two air cleaner case retaining bolts (1) and remove the air cleaner case assembly.



13. Disconnect and remove the following electrical connectors:
    - Coolant temperature sensor
    - Camshaft position sensor
    - Ignition coil
    - Four fuel injectors
    - Intake manifold air pressure sensor
    - Carbon canister solenoid valve
    - Crankshaft position sensor
    - Throttle body control
    - A/C compressor
    - Oil pressure sensor
    - Power steering pump pressure switch
    - Generator
    - Backup lamp switch
    - Vehicle speed sensor
14. Remove the pipe (1) from the canister control valve.



15. Disconnect the heater hoses (1) on the vehicle.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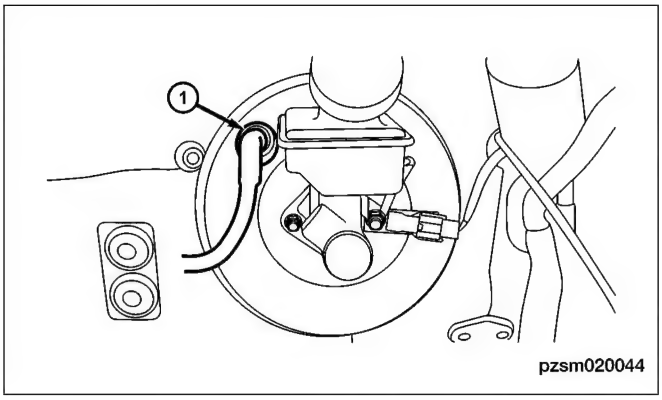
16. Remove the vacuum line (1) from the brake booster.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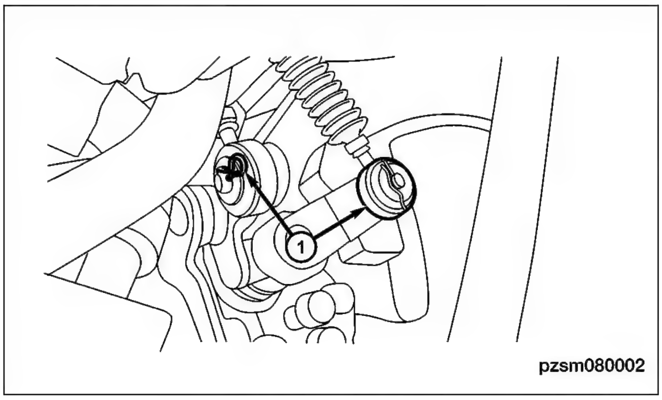
17. Remove the dipstick.
18. Remove the transaxle shift cable (1).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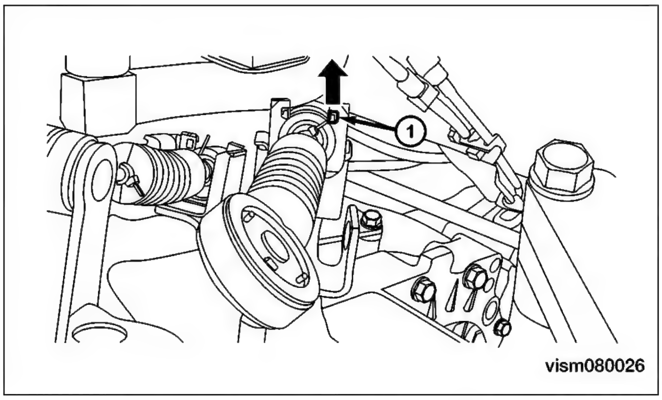
19. Remove the shift cable clamp (1) from the shift cable bracket.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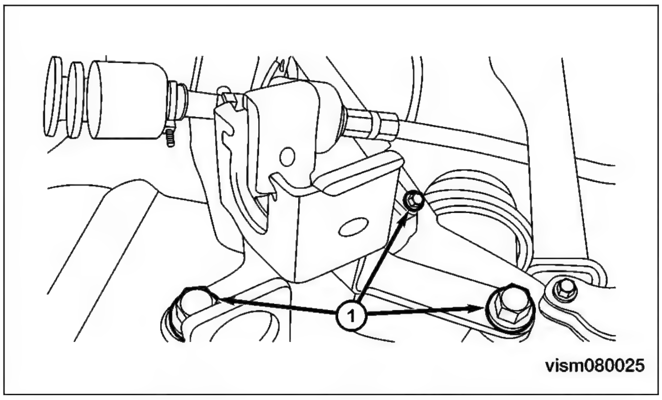
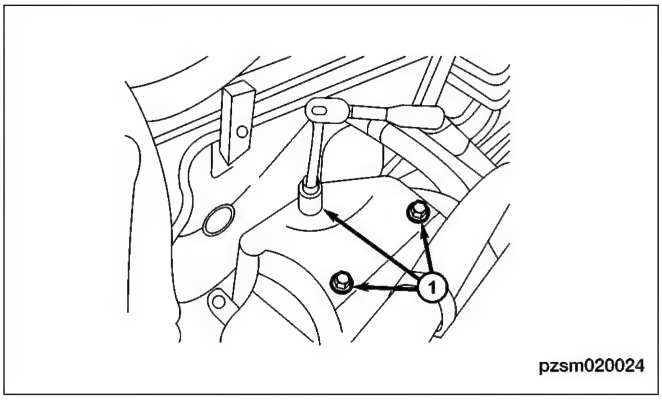
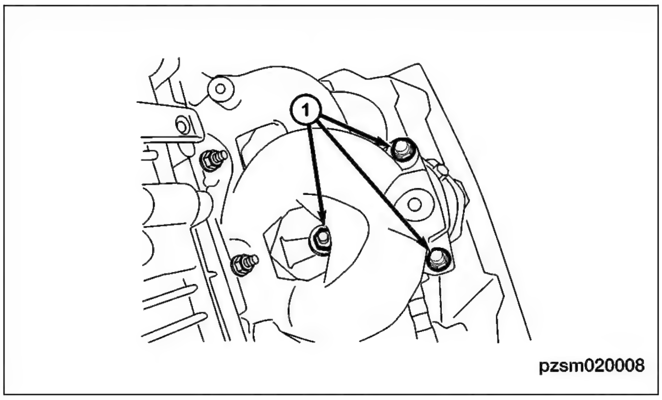
20. Remove the three shift cable bracket retaining bolts (1).
    (Tighten: Shift cable bracket retaining bolts to 25 ± 5 N·m)



21. Remove the three exhaust manifold heat shield bolts (1) and then remove heat shield.
    (Tighten: Exhaust manifold heat shield bolts to 20 ± 5 N·m)

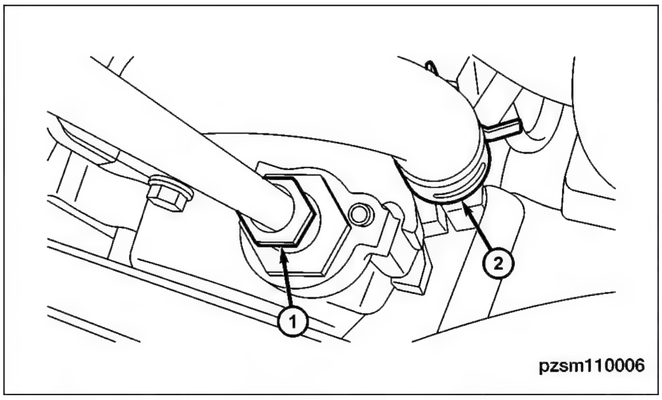


22. Disconnect the upstream and downstream oxygen sensor connectors.
23. Remove the three catalytic converter to exhaust manifold bolts (1).
    (Tighten: Catalytic converter to exhaust manifold bolts to 60 ± 5 N·m)

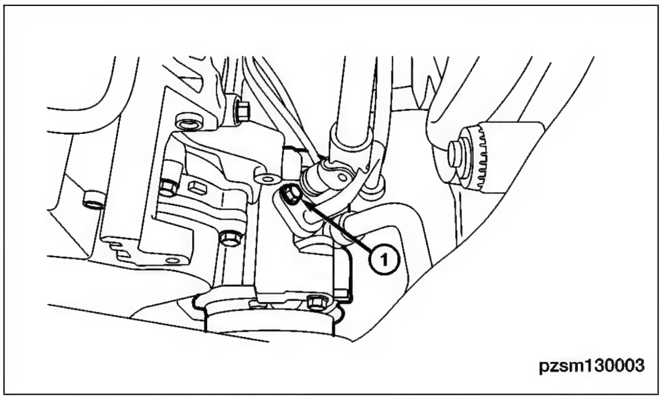


24. Remove the front axle shaft (See Front Axle Shaft Removal & Installation in Section 09 Driveline & Axle).
25. Drain the steering oil.

26. Remove the power steering pump pressure pipe (1) and return hose clamp (2).

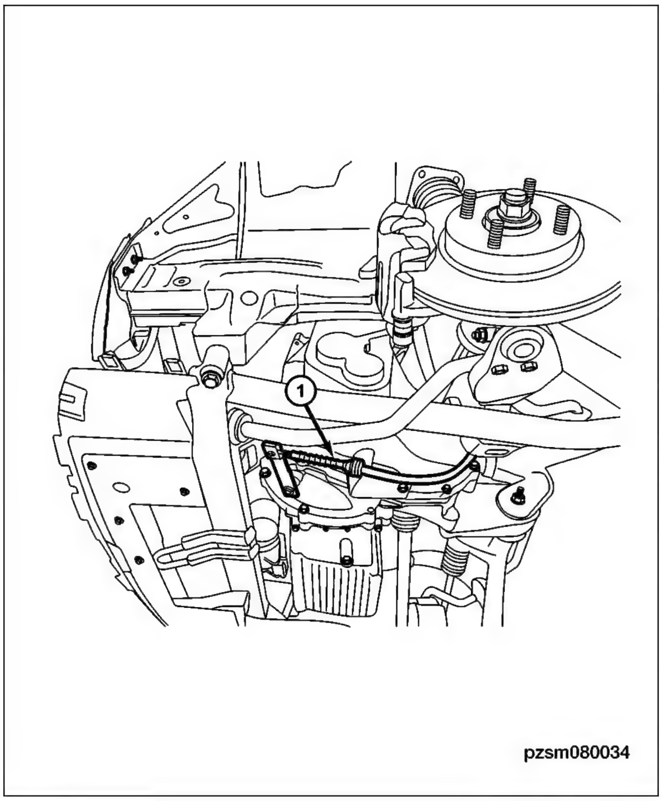


27. Remove the A/C compressor line bolt (1) from the A/C compressor.
    (Tighten: A/C compressor line bolts to 20 ± 5 N·m)
    NOTE: After removing the A/C lines, plug the A/C lines to prevent any debris from entering the A/C system.

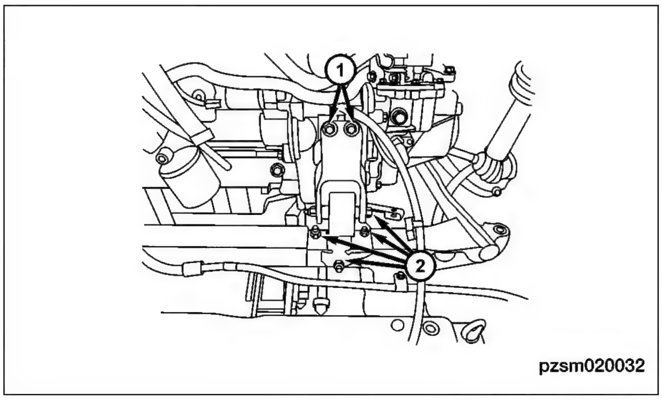


28. Raise and support the vehicle.
29. Drain the engine oil.
30. Remove the exhaust pipe assembly (See Exhaust Pipe Assembly Removal & Installation in Section 07 Exhaust).
31. Remove the suction line retaining bolts on the front sub-frame.

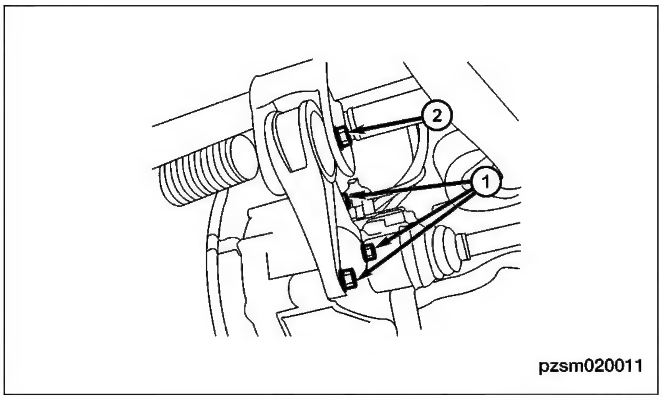
32. Disconnect the clutch cable (1) from the clutch housing and position it aside.



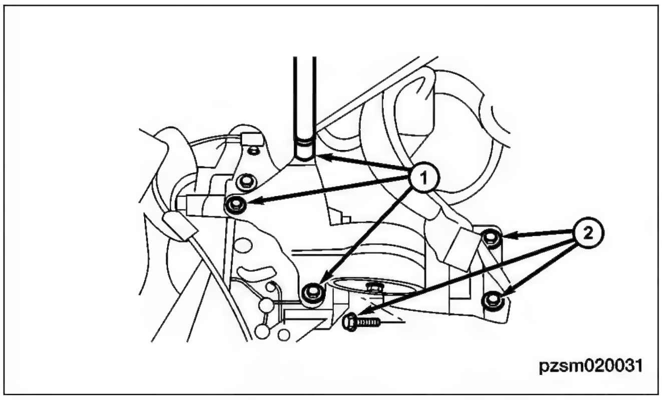
33. Lower the vehicle and install engine lift chain hangers.
34. Remove the two front engine mount bolts (1) and the four front engine mount bracket bolts (2).
(Tighten: Engine front mount bolt to 80 ± 5 N·m)



35. Remove the rear engine mount bolt (1) and the three rear engine mount bracket bolts (2).
(Tighten: Engine rear mount bolt to 60 ± 5 N·m)



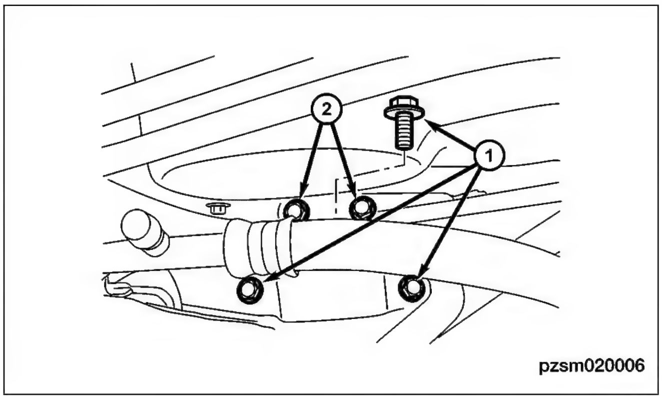
36. Remove the three left transaxle mount bolts (1) and the three left transaxle mount bracket bolts (2). (Tighten: Left transaxle mount bolt to 65 ± 5 N·m)



37. Using special tool CH-20001, remove the two right engine mount bolts (1) and three right engine mount bracket bolts (2).
    (Tighten: Engine right mount bolt to 65 ± 5 N·m)
38. Verify all components between the engine and vehicle are disconnected.
39. Remove the front sub-frame (See Front Sub-Frame Removal & Installation in Section 10 Suspension).
40. Hoist the engine from the vehicle.

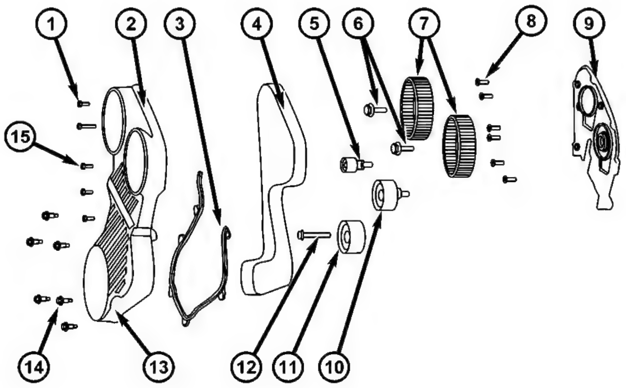
CAUTION:
Verify all electrical connectors are disconnected prior to engine/transaxle removal.

41. Separate the engine and transaxle.
42. Installation is in the reverse order of removal.



Engine Timing Belt

Removal & Installation



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1 - Timing Belt Upper Cover Bolt
2 - Timing Belt Upper Cover
3 - Timing Belt Cover Gasket
4 - Timing Belt
5 - Timing Belt Touch Pulley
6 - Camshaft Bolt
7 - Camshaft
8 - Rear Timing Cover Bolt

9 - Rear Timing Cover
10 - Idler Pulley
11 - Tensioner Pulley
12 - Tensioner Pulley Bolt
13 - Timing Belt Lower Cover
14 - Timing Belt Lower Cover Bolt
15 - Timing Belt Upper Cover Bolt

NOTE :
The following special tools are required to perform the repair procedure:

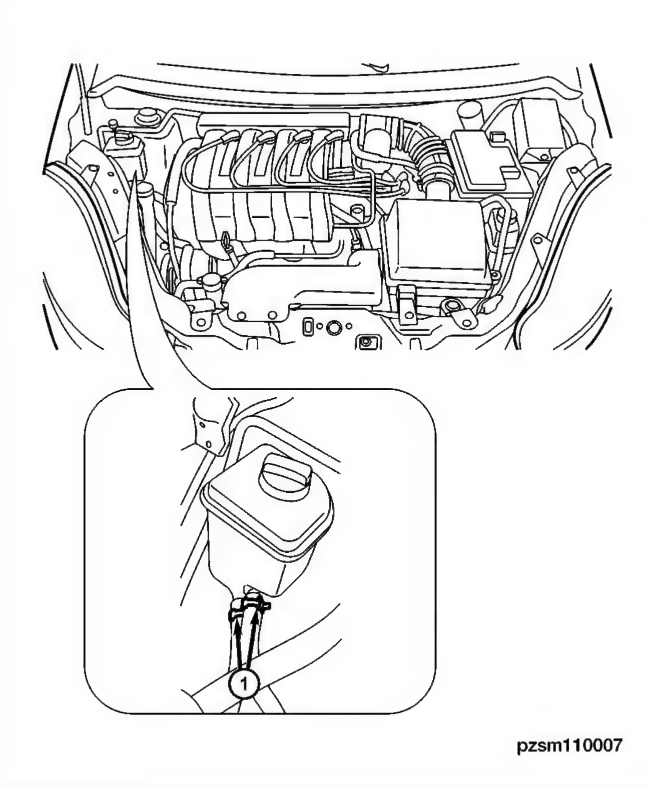
- CH-20001 - Right Engine Mount Bolt Remover
- CH-20003 - Crankshaft Holder
- CH-20010 - Camshaft Holder
- Engine Hoist

1. Relieve the fuel pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
2. Disconnect the negative battery cable.
3. Drain the cooling system (See Cooling System Draining and Filling in Section 06 Cooling).

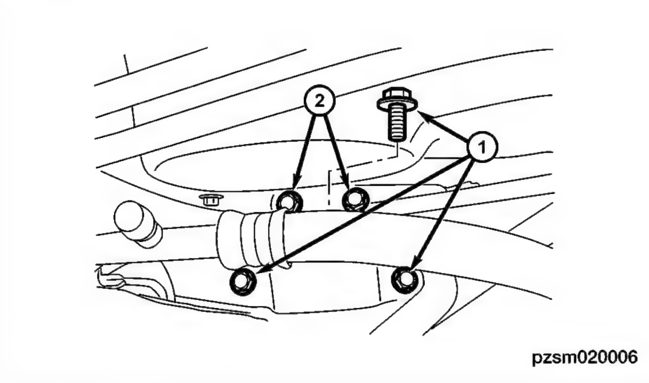
WARNING!

Always allow the engine to cool before opening the cooling system. Do not loosen the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

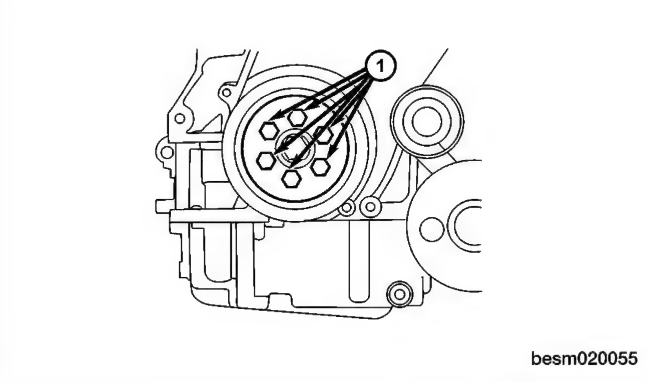
4. Remove the coolant reservoir clamps (1) and set aside.



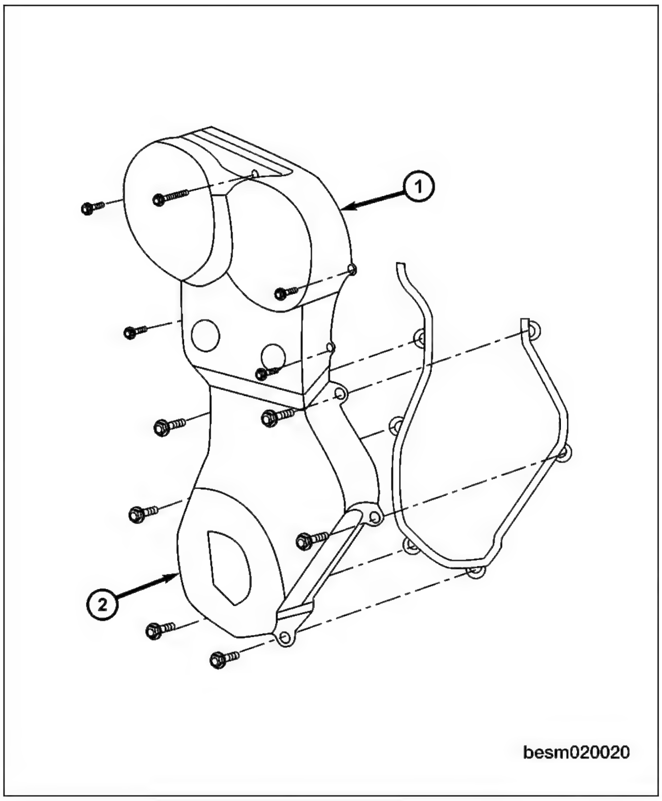
5. Attach an engine hoist and support the engine using the engine hoist.
6. Using special tool CH-20001, remove the engine right mount bolts (1) and bracket bolts (2).
(Tighten: Engine right mount bolts to 65 ± 5 N·m)



7. Remove the accessory drive belt (See Accessory Drive Belt Removal & Installation in Section 02 Engine).
8. Remove the six crankshaft vibration damper bolts (1).
(Tighten: Crankshaft vibration damper bolts to 25 ± 5 N·m and an additional 30 ± 5°)

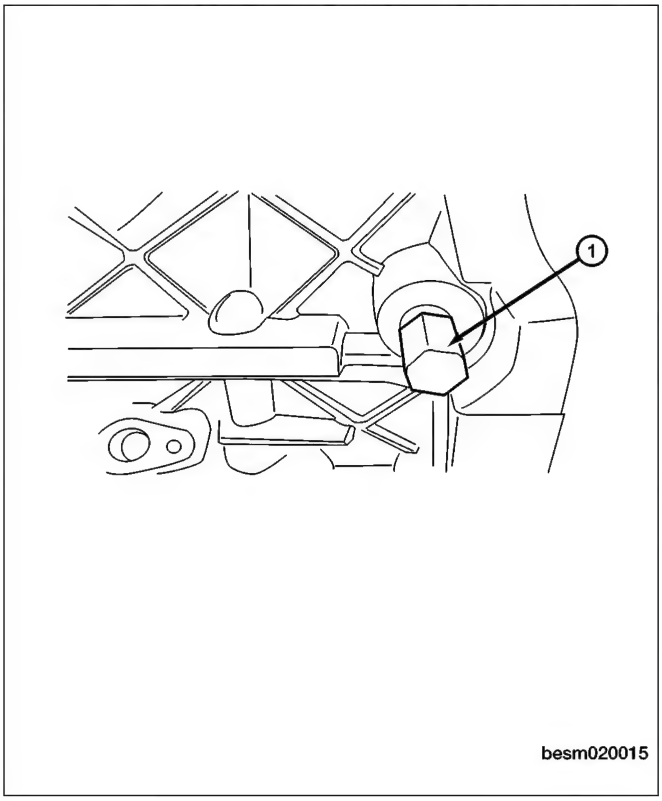


9. Remove the timing belt upper cover (1) and the timing belt lower cover (2).
   (Tighten: Timing belt upper cover bolts to 8 ± 3 N·m)
   (Tighten: Timing belt lower cover bolts to 8 ± 3 N·m)



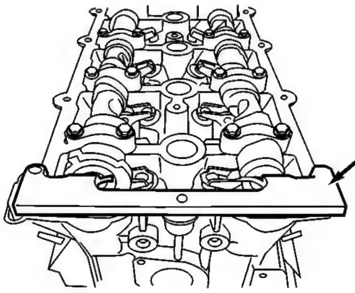
10. Remove the intake manifold (See Intake Manifold Removal & Installation in Section 02 Engine).
11. Remove the cylinder head cover (See Cylinder Head Cover Removal & Installation in Section 02 Engine).
12. Remove the plug in the cylinder block.
13. Using special tool CH-20003 (1), install the crankshaft holder (1) into the cylinder block and rotate the crankshaft until the crankshaft tool completely holds the crankshaft in place.
    (Tighten: Crankshaft holder to 28 N·m)

    NOTE: The crankshaft holder will prevent the crankshaft from rotating in either direction.



14. Using special tool CH-20010 (1), install the camshaft holder to hold the camshafts in place.

    NOTE: The camshaft holder will prevent the camshafts from rotating in either direction.



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CAUTION: Rotating the camshafts or crankshaft with timing components loosened or removed can cause serious damage to the valves or pistons.

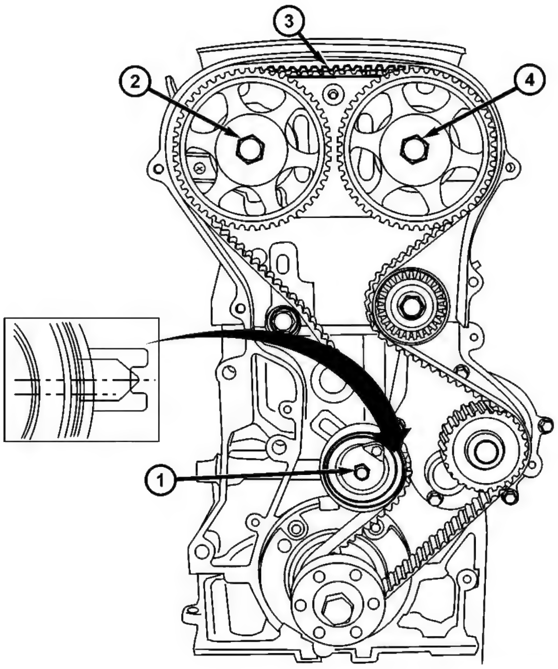
15. Loosen the bolt of the timing belt tensioner pulley (1) and remove the pulley.
    (Tighten: Timing belt tensioner pulley bolt to
    27 ± 3 N·m)
16. Remove the timing belt (3).

NOTE :
When removing the timing belt, pay attention to the operating direction of the timing belt. Refer to the operating direction of the engine crankshaft and the arrow head direction on the timing belt.

17. Installation is in the reverse order of removal.

Installation Notes:

- Install the timing belt and rotate the tensioner pulley with an Allen wrench in order to apply tension to the belt and align the finger pointer of the tensioner to the middle of the U-slot opening.
- Tighten the tensioner pulley bolt (1) to 27 ± 3 N·m.
- Tighten the intake and exhaust camshaft pulley bolts (2) & (4) to 120 ± 5 N·m.



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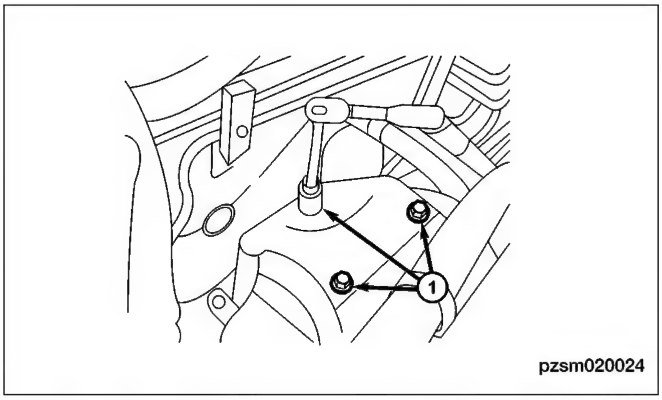
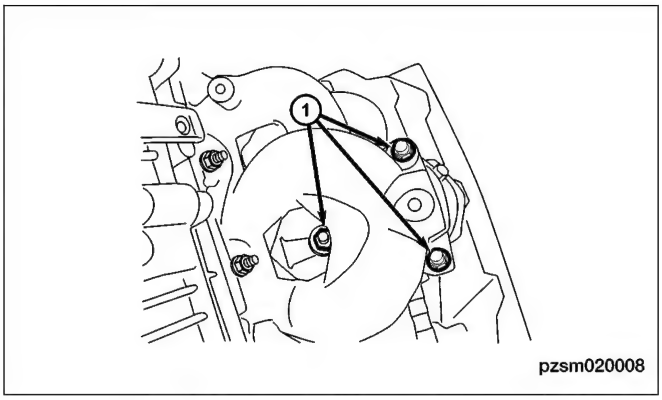
Exhaust Manifold

Removal & Installation

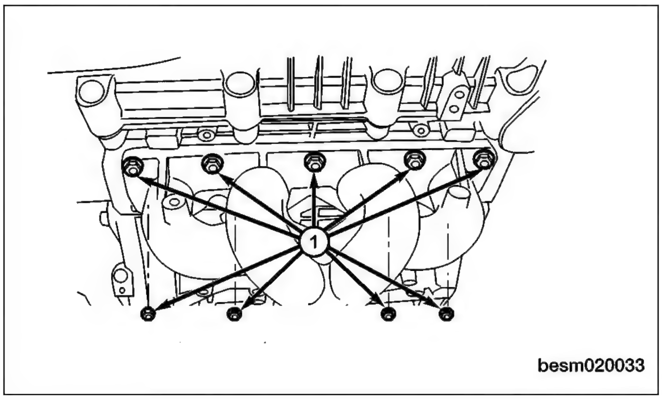
1. Remove the three bolts (1) attaching the exhaust manifold heat shield.
   (Tighten: Exhaust manifold heat shield bolts to 10 ± 5 N·m)
2. Remove the exhaust manifold heat shield.



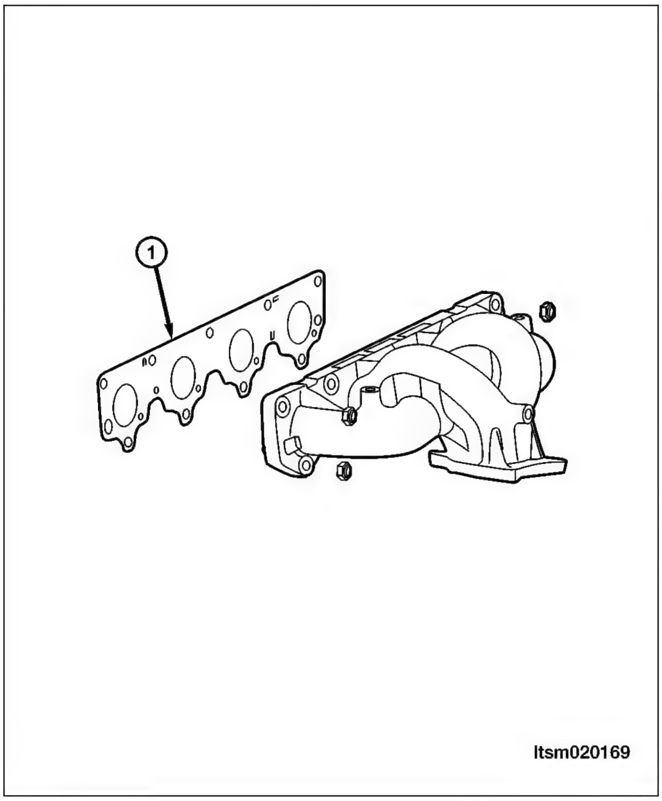
3. Remove the three bolts (1) securing the exhaust manifold to the catalytic converter assembly.
   (Tighten: Exhaust manifold to the catalytic converter bolts to 60 ± 5 N·m)
4. Disconnect the catalytic converter assembly from the manifold.



5. Remove the ten exhaust manifold nuts (1).
   (Tighten: Exhaust manifold nuts to 20 ± 5 N·m)



6. Remove and discard the exhaust manifold gasket (1).



7. Installation is in the reverse order of removal.

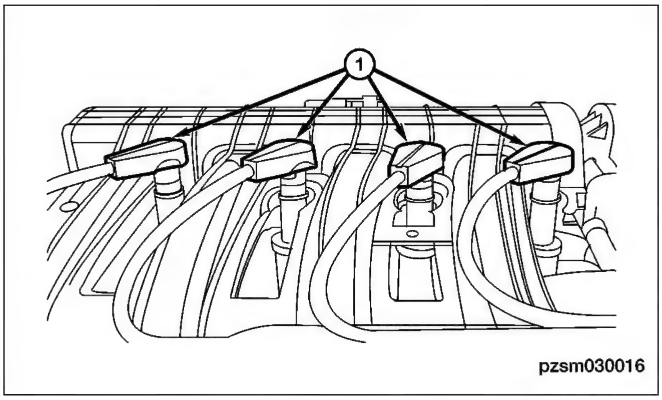
Installation Notes:

- Clean all surfaces of manifold and cylinder head.

Intake Manifold

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the four spark plug wires (1) and set them aside.



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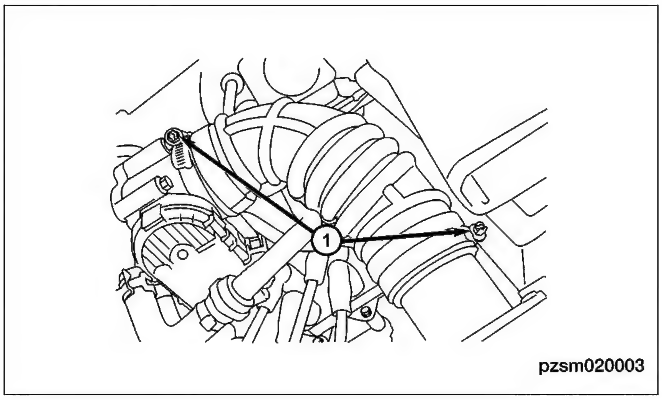
3. Remove the clamps (1) between the intake manifold and the air cleaner housing.



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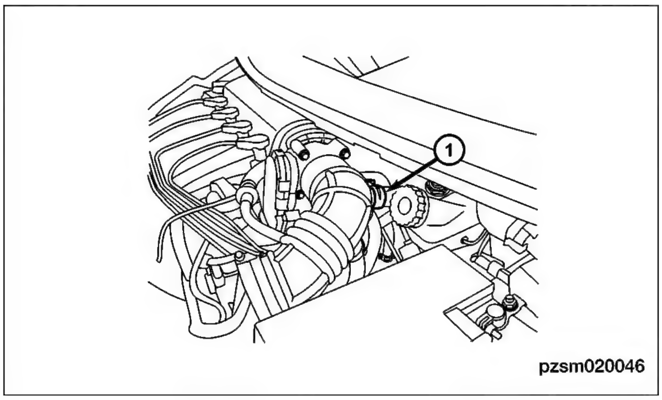
4. Remove the PCV return hose clamp (1) on the intake manifold hose.



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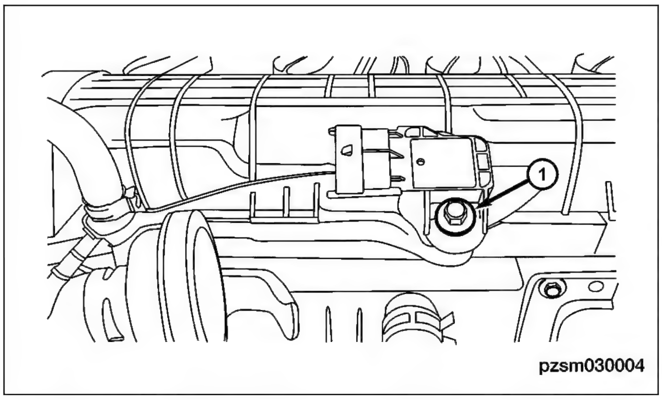
5. Remove the air intake hose.

6. Disconnect the manifold air pressure (MAP) sensor electrical connector.
7. Remove the MAP sensor retaining bolt (1), and then remove the MAP sensor.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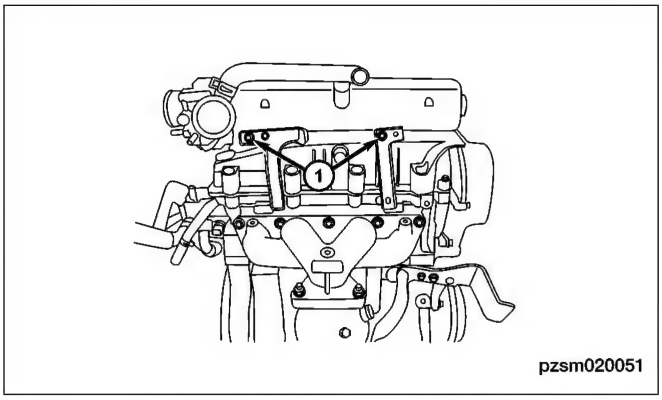
8. Remove the intake manifold bracket retaining bolts (1).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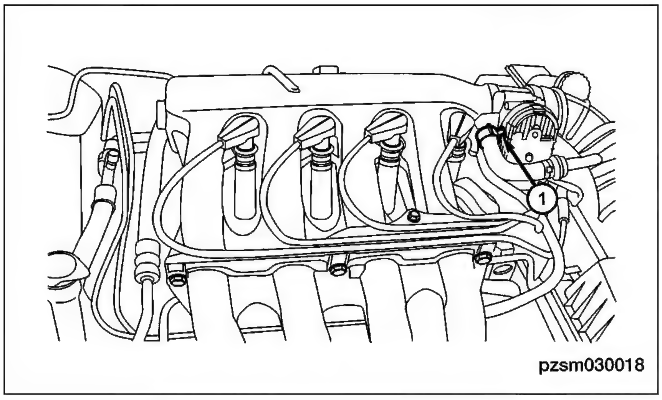
9. Remove the fuel vapor return hose (1) from the throttle body.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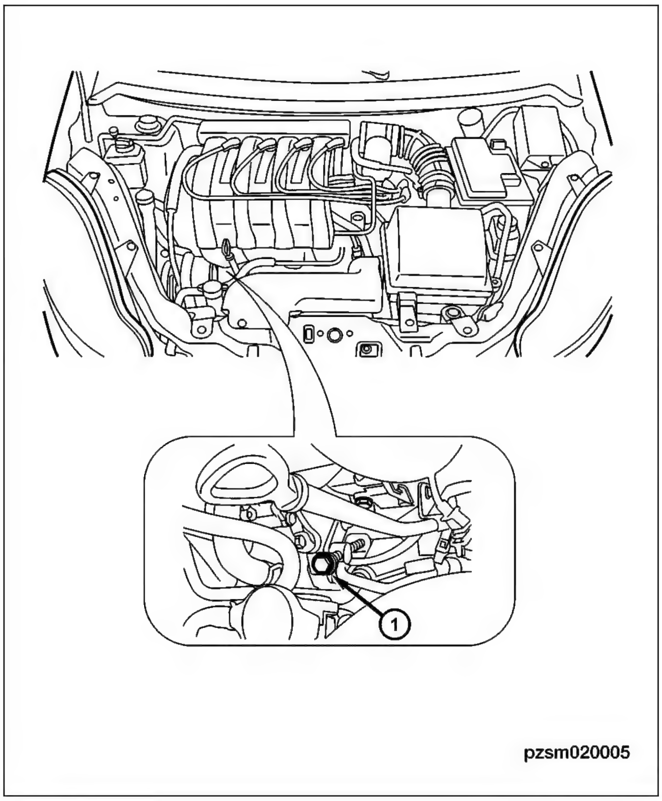
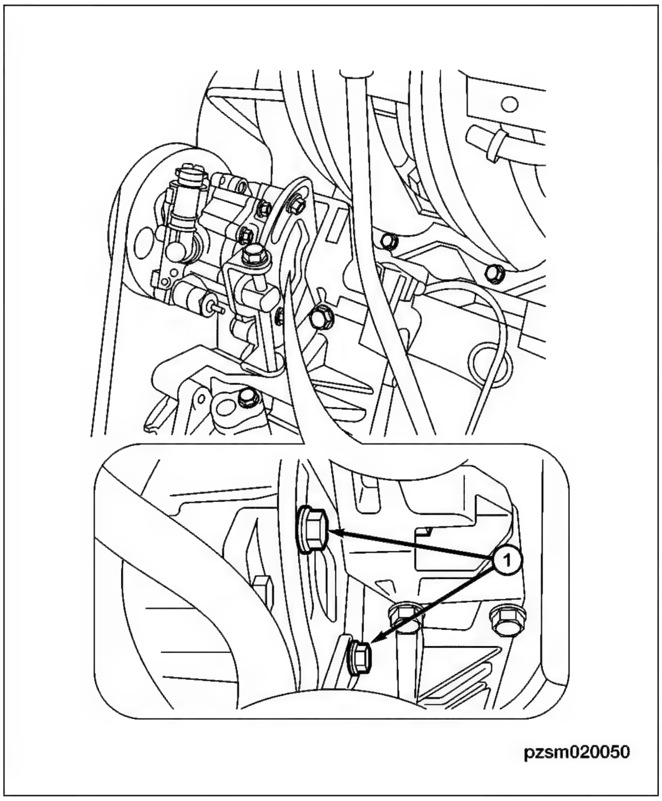
10. Loosen the power steering pump adjustment bolt (1).

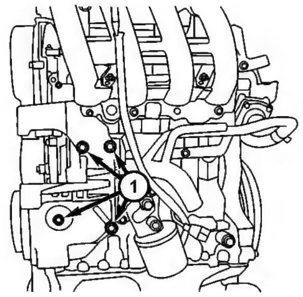


11. Loosen the bolts (1) on the steering pump bracket.



12. Remove the A/C compressor belt.
13. Remove the steering pump (See Steering Pump Removal & Installation in Section 11 Steering).
14. Remove the A/C compressor (See A/C Compressor Removal & Installation In Section 13 Heating & Air Conditioning).

15. Remove the four A/C compressor bracket retaining bolts (1).



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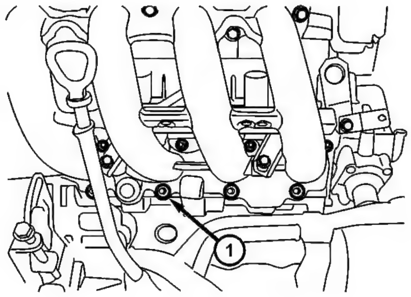
16. Remove the eight lower intake manifold retaining bolts (1).
(Tighten: Lower intake manifold bolts to 8 ± 3 N·m)



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17. Remove the lower intake manifold and gasket.
18. Remove and discard the intake manifold gasket.

NOTE :
Install a new intake manifold gasket during reassembly.

19. Installation is in the reverse order of removal.

Installation Notes:

- Clean all surfaces of manifold and cylinder head.
- Install new O-rings on the fuel injectors.

Oil Filter

Removal & Installation

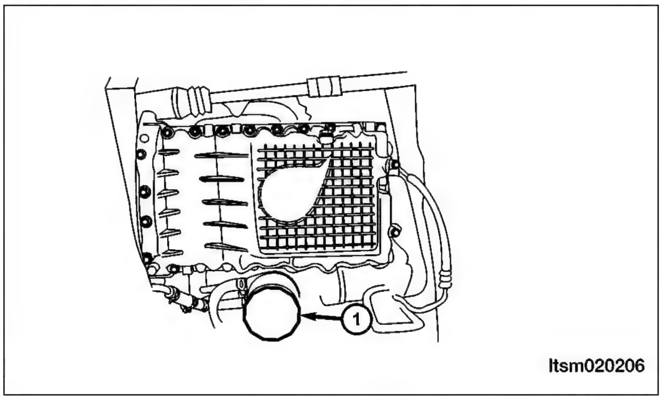
NOTE :
The following special tools are required to perform the repair procedure:
- CH-10003 - Oil Filter Remover

WARNING!

Prolonged and repeated contact with engine oil will harm your skin. If engine oil is spilled on your skin, wash it off immediately with water. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Always use adequate skin protection when performing vehicle service.

CAUTION:
When servicing the oil filter, avoid deforming the filter by installing the special tool against the base of the filter.

1. Using special tool CH-10003, remove the oil filter (1).
   (Tighten: Oil filter to 25 ± 3 N·m)
   CAUTION: When removing the oil filter, ensure that the oil filter gasket is not stuck to the engine. The oil filter gasket must be removed from the engine before installing the new oil filter.
2. Installation is in the reverse order of removal.



Installation Notes:

- Lubricate the oil filter gasket ring with clean engine oil.
- Clean all surfaces, and verify the oil filter does not leak.

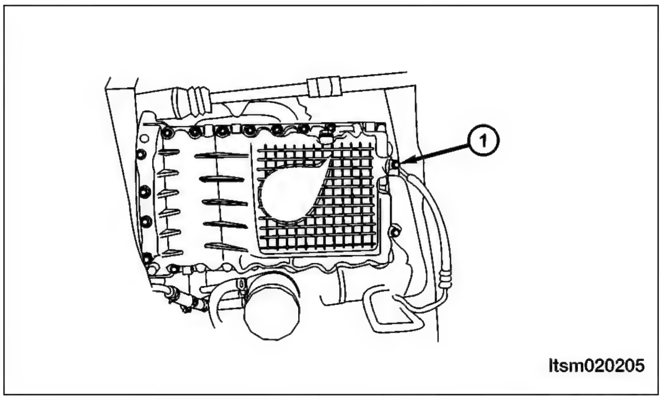
Oil Pan

Removal & Installation

1. Remove the oil dipstick.
2. Raise and support the vehicle.
3. Remove the oil pan drain plug and drain the engine oil.
   (Tighten: Oil pan drain plug to 40 N·m)

NOTE :
Do not pry on cylinder block to remove oil pan.

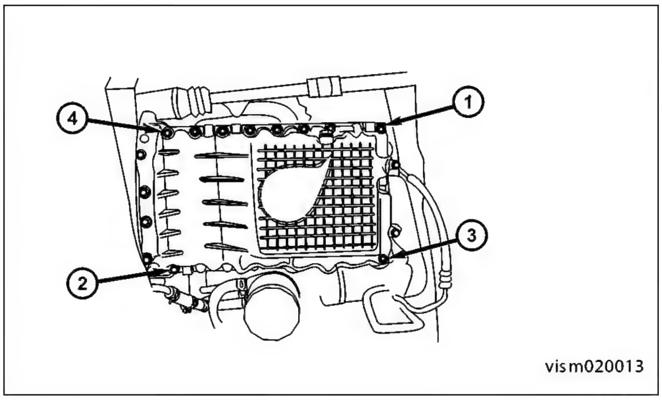
4. Remove oil pan bolts (1).
   (Tighten: Oil pan bolts to 18 N·m)



5. Using a putty knife, loosen the seal around the oil pan.
6. Remove the oil pan.
7. Installation is in the reverse order of removal.

Installation Notes:

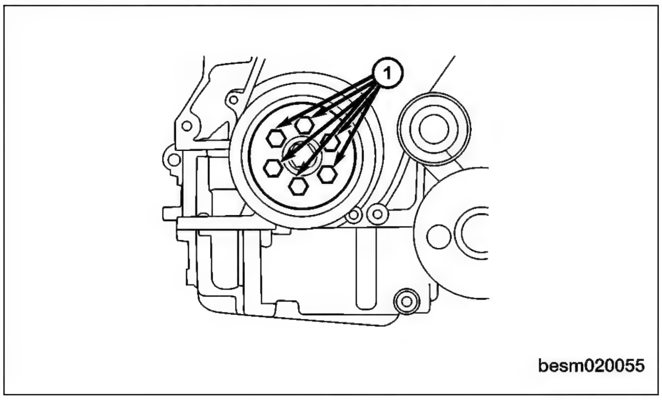
- Oil pan sealing surfaces must be free of grease or oil.
- Install the four oil pan corner bolts in the sequence shown (1-2-3-4).
- Install the remaining oil pan bolts.
- Torque all the oil pan bolts to the proper specification.



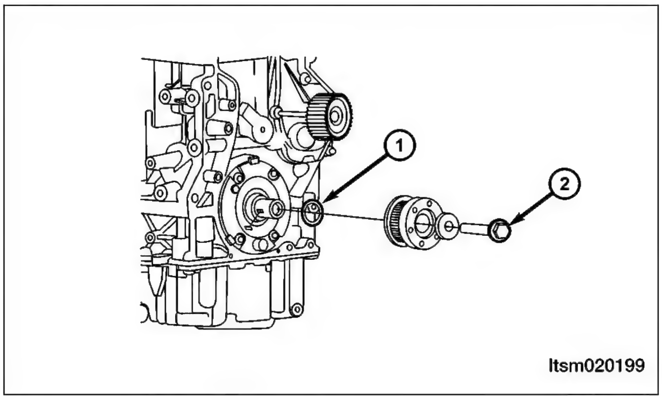
Oil Pump

Removal & Installation

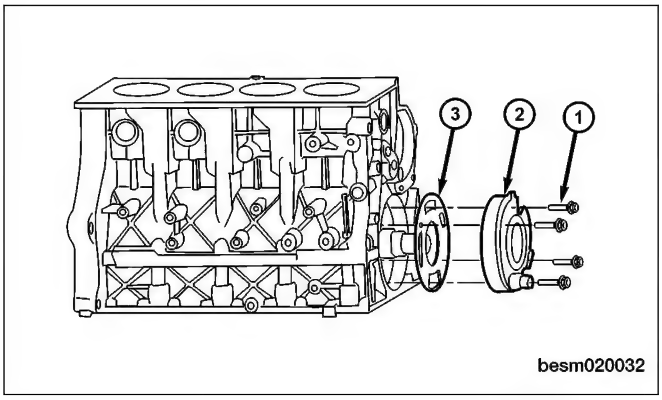
1. Remove the accessory drive belt (See Accessory Drive Belt Removal & Installation in Section 02 Engine).
2. Remove the six crankshaft vibration damper retaining bolts (1).
   (Tighten: Crankshaft vibration damper bolts to 25 ± 5 N·m and an additional 30 ± 5°)



3. Remove the engine timing belt (See Engine Timing Belt Removal & Installation in Section 02 Engine).
4. Remove the crankshaft timing belt pulley bolt (2) from the crankshaft.
   (Tighten: Crankshaft timing belt pulley bolt to 130 ± 10 N·m and an additional 65 ± 5°)
5. Remove the key-way from the crankshaft.
6. Use an appropriate tool and remove the front crankshaft oil seal (1).



7. Remove the four oil pump bolts (1).
   (Tighten: Oil pump bolts to 8 ± 3 N·m)
8. Remove the oil pump (2) using a suitable tool.
9. Remove the oil pump gasket (3).



10. Installation is in the reverse order of removal.

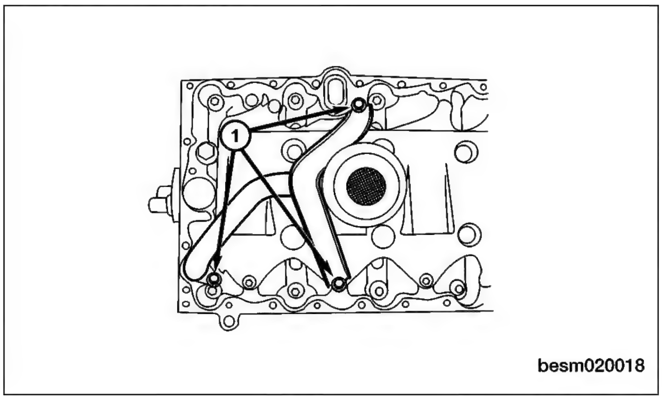
Installation Notes:

- Before installing, prime the new oil pump. Fill the oil pump with engine oil and rotate the oil pump.
- Replace the oil pump gasket.

Oil Strainer

Removal & Installation

1. Raise and support the vehicle.
2. Remove the oil pan (See Oil Pan Removal & Installation in Section 02 Engine).
3. Remove the three oil strainer retaining bolts (1).
   (Tighten: Oil strainer bolts to 18 N·m)



4. Carefully remove the oil strainer.
5. Installation is in the reverse order of removal.

Installation Notes:

- Install new O-ring on the oil strainer pipe.

ENGINE UNIT REPAIR

Engine Block

Specifications

Torque Specifications

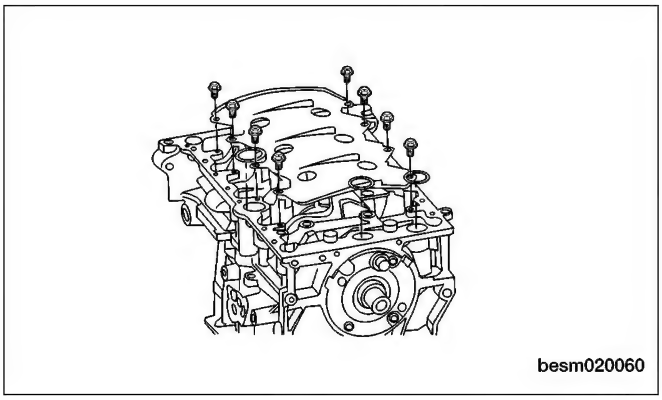
DESCRIPTION	TORQUE (N·m)
Connecting Rod Cap Bolts	1st Step: Tighten the bolt to 25 ± 3 N·m 2nd Step: Tighten the bolt an additional 90 ± 5°
Main Bearing Cap Bolts	1st Step: Tighten the bolt to 45 ± 5 N·m 2nd Step: Tighten the bolt an additional 180 ±10°
Lower Cylinder Block Bolts	20 ± 3

Cylinder Bore Specifications

DESCRIPTION	SPECIFICATION (mm)
Surface Distortion Limit	0.15
Inner Diameter Standard	73.005 ± 0.005
Out-Of-Round	Less than 0.008
Taper	Less than 0.01

Disassembly

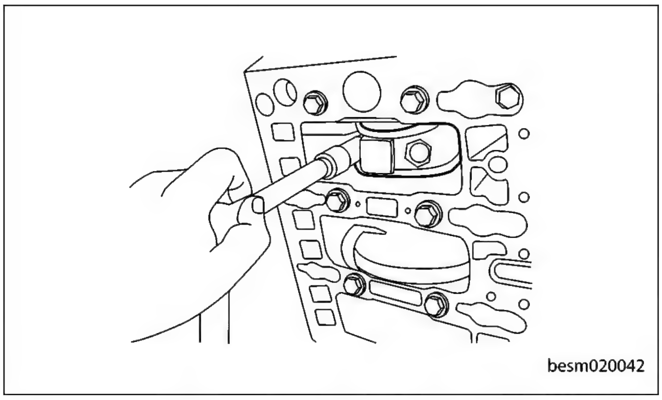
1. Remove the oil pan and then remove the oil baffle.
2. Remove the oil strainer.



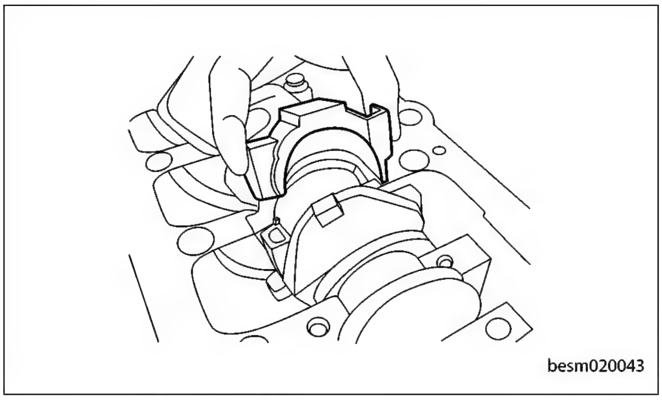
3. For each connecting rod / piston assembly to be removed, rotate the crankshaft to the bottom dead center position for each cylinder.

NOTE :
Before removing the connecting rod / piston assembly, check the connecting rod side clearance.

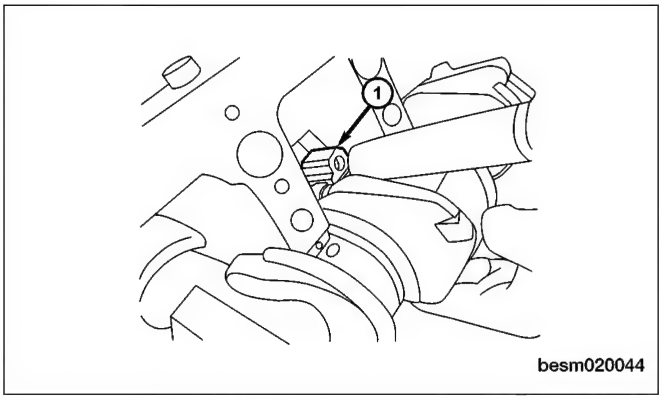
4. Remove the eight connecting rod retaining bolts.



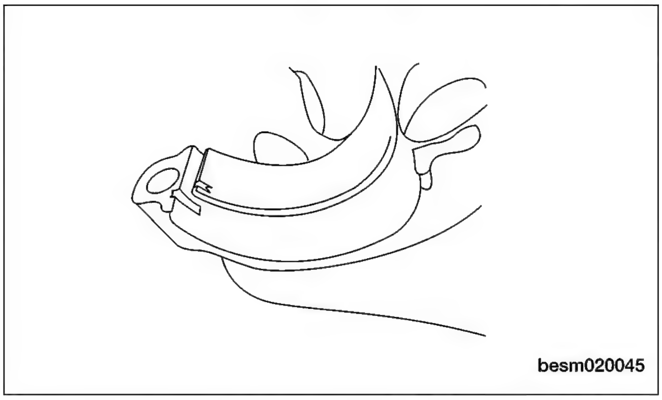
5. Remove the connecting rod bearing cap.



6. Using a hammer handle or similar tool, push the connecting rod / piston assembly (1) out through the top of the cylinder block.



7. Remove the connecting rod bearings (See Connecting Rod Removal & Installation in Section 02 Engine).



CAUTION: When removing the connecting rod side bearings, note the installation position. Keep them in the correct order.

8. Installation is in the reverse order of removal.

Inspection

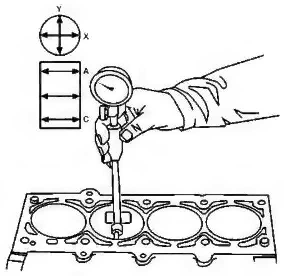
NOTE :
All measurements should be taken with the engine block at room temperature, 21°C.

Engine Block

- Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.
- Examine block and cylinder bores for cracks or fractures.
- Check block deck surfaces for flatness. Deck surface must be within service limit of 0.050 mm.

Cylinder Bore

- The cylinder walls should be checked for out-of-round and taper with cylinder indicator or equivalent. If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.
- Measure the cylinder bore at three levels in directions X and Y. Top measurement should be 10 mm down and bottom measurement should be 10 mm up from bottom of bore.



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CYLINDER BORE	
All Cylinders	73.005 ± 0.005 mm

Assembly

NOTE :
Cleanliness is extremely important during the engine assembly procedure. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

NOTE :
Assemble all components in their original position.

1. Install the pistons to the connecting rods.
2. Using a piston ring expander, install the piston rings.
3. Assemble all components in the reverse order of disassembly.

Pistons

Specifications

Clearance Specifications - Pistons

DESCRIPTION	SPECIFICATION (mm)
Surface Distortion Limit	0.15
Inner Diameter Standard	73.005 ± 0.005
Out-Of-Round	Less than 0.008
Taper	Less than 0.01

Clearance Specifications - Piston Ring Groove

DESCRIPTION	SPECIFICATION
First Ring	0.035 - 0.08 mm
Second Ring	0.025 - 0.07 mm

Clearance Specifications - Piston Ring End Gap

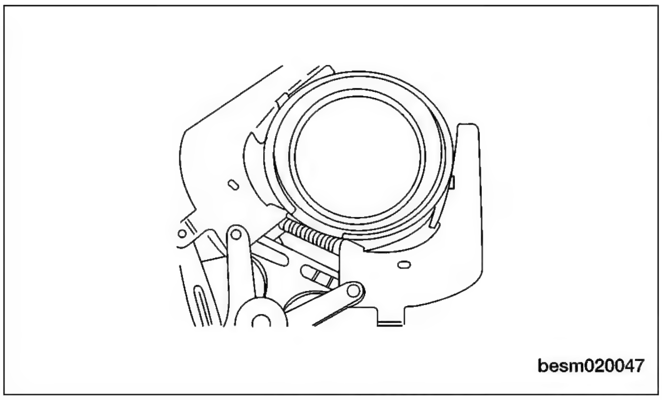
DESCRIPTION	SPECIFICATION	LIMIT
First Ring End Gap	0.2 - 0.4 mm	0.8 mm
Second Ring End Gap	0.4 - 0.6 mm	1.0 mm

Clearance Specifications - Piston to Piston Pin

DESCRIPTION	SPECIFICATION
Piston To Piston Pin	0.002 - 0.013 mm

Disassembly

- Piston Ring Removal
  - Using a suitable ring expander, remove the upper and intermediate piston rings.
  - Remove the upper oil ring side rail, lower oil ring side rail and then oil ring expander from piston.
  - Clean ring grooves of any carbon deposits.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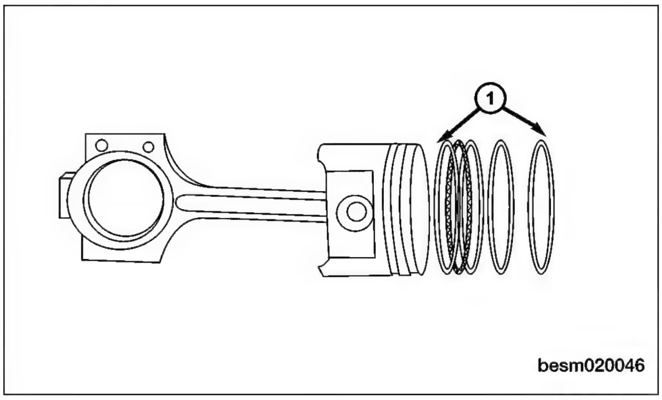
CAUTION:
Before removing the piston rings (1), check the piston ring side clearance. Be careful to mark the location of the piston rings if they are to be reused.



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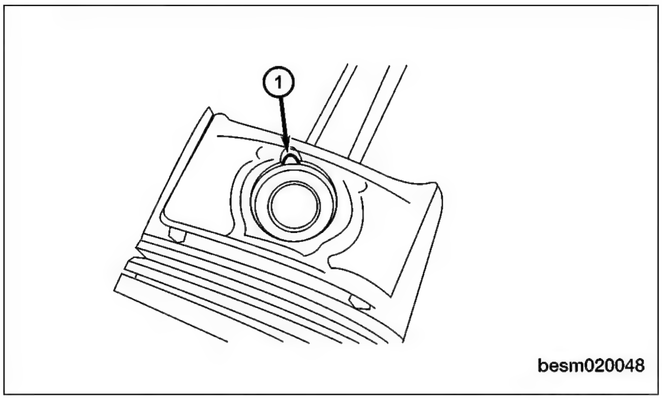
- Piston Pin Snap Ring Removal
  - Using snap ring pliers, remove the snap ring (1).
  - Heat the pistons if necessary.



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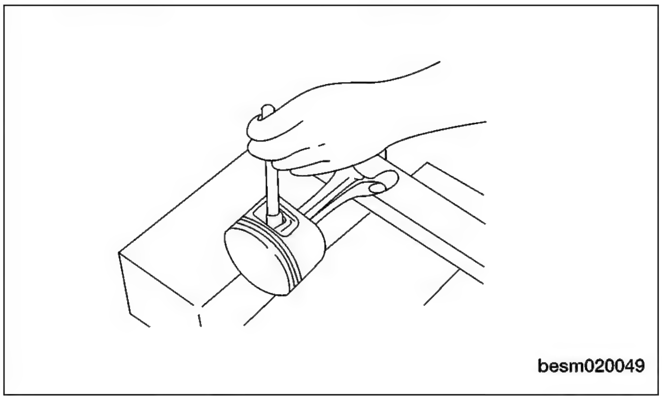
- Piston Pin Removal
  - Push out the piston pin with a suitable tool.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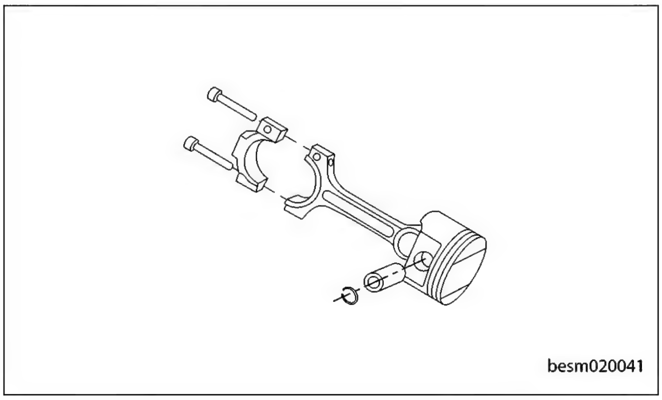
- Connecting Rod & Piston Disassembly
  - Remove the piston from the connecting rod.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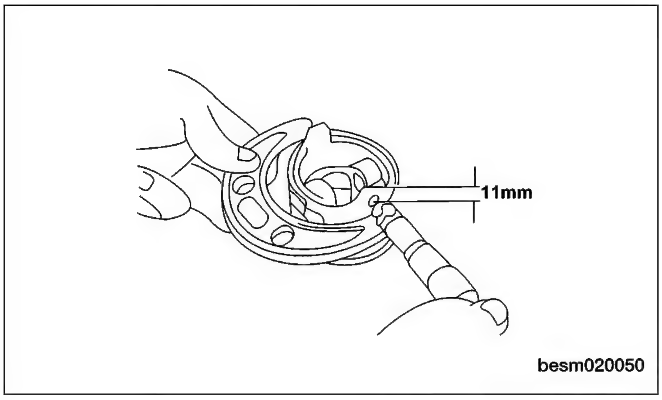
Inspection

Check the piston diameter.


11mm
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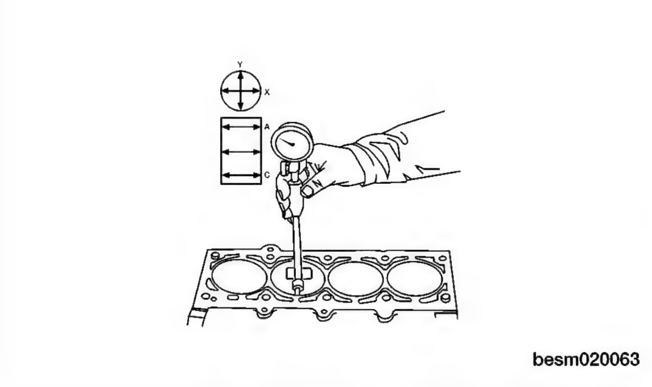
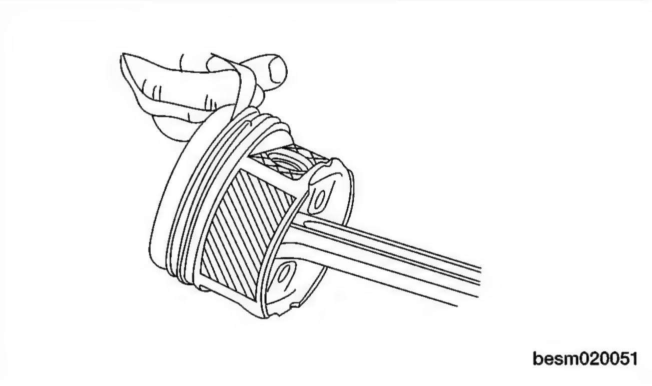
PISTON DIAMETER	
All Pistons	72.965 ± 0.009 mm

Check the inner diameter of each cylinder bore (See Cylinder Bore Inspection in Section 02 Engine).



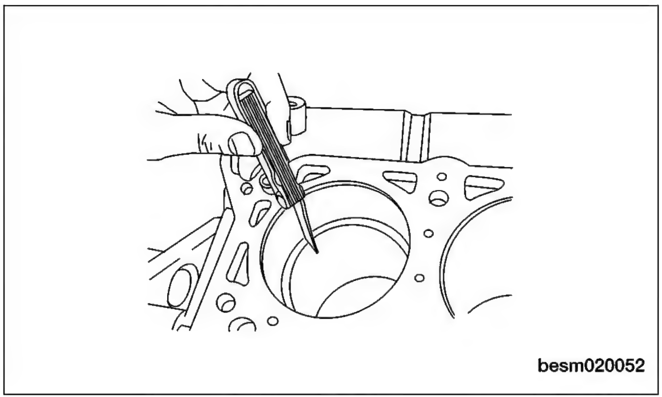
CYLINDER BORE	
All Cylinders	73.005 ± 0.005 mm

Check piston ring to groove side clearance.
- Clean the ring slot using a suitable tool.
- Measure piston ring to groove side clearance.



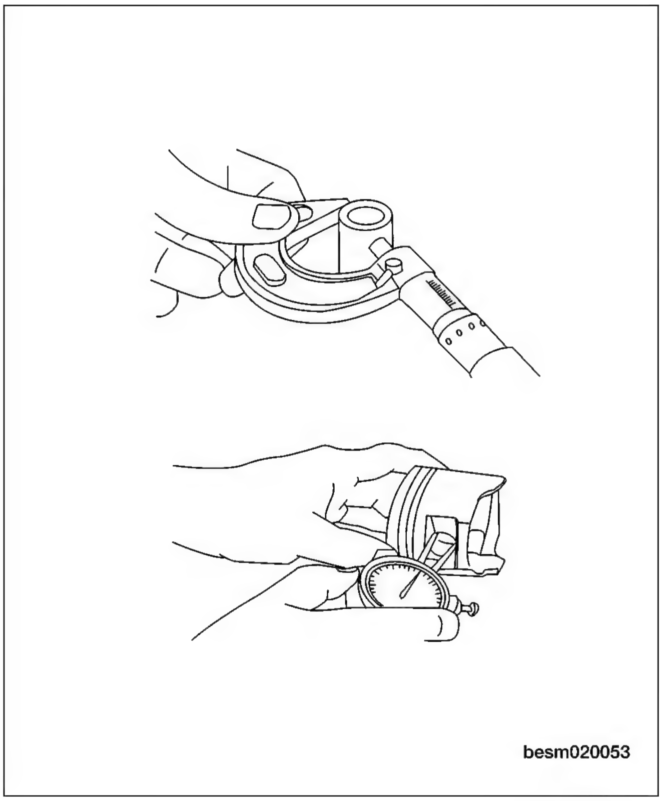
RING GROOVE CLEARANCE	
First Ring	0.035 - 0.08 mm
Second Ring	0.025 - 0.07 mm

Check piston ring end gap clearance:
- Wipe the cylinder bore clean.
- Insert ring and push down with piston to ensure it is square in the bore.
- The ring end gap measurement must be made with the ring positioned at least 13 mm from bottom of cylinder bore and below the bottom of the oil ring travel where the cylinder bore has minimal wear.
- Check the ring end gap with a feeler gauge.

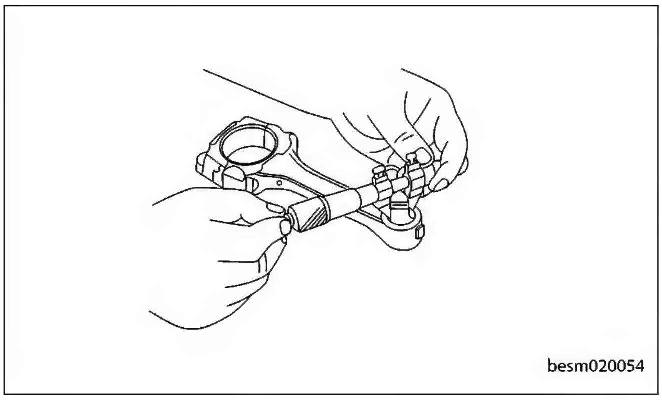


RING END GAP CLEARANCE		
First Ring	0.2 - 0.4 mm	0.8 mm
Second Ring	0.4 - 0.6 mm	1.0 mm

- Check the diameter of the piston pin bore.
- Check the outer diameter of the piston pin.



- Check the inner diameter of connecting rod (small end).



PISTON PIN CLEARANCE	
Piston and Piston Pin	0.013 - 0.018 mm

Assembly

1. Install the piston to the connecting rod. Assemble the components in their original positions.
2. Using a piston ring expander, install the piston rings. Assemble the components in their original positions.
3. Assemble all components in the reverse order of disassembly.

Connecting Rods

Specifications

Torque Specifications

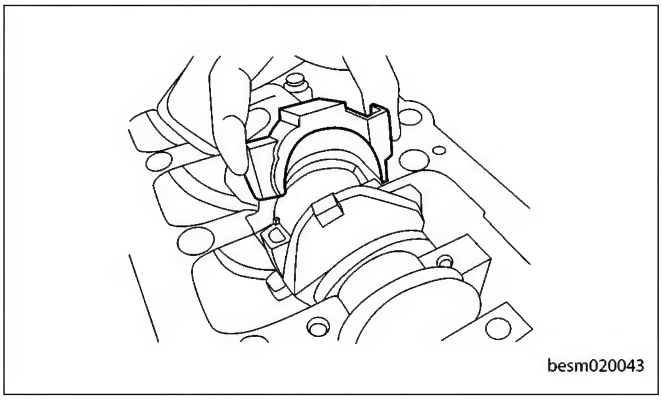
DESCRIPTION	TORQUE (N·m)
Connecting Rod Bolts	1st Step: Tighten bolts to 25 ± 3 N·m 2nd Step: Tighten the connecting rod bolts an additional 90 ± 5°

Clearance Specifications

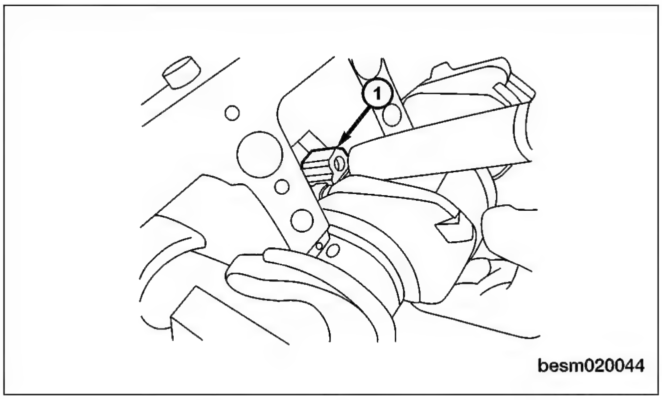
DESCRIPTION	SPECIFICATION
Connecting Rod Radial Clearance	0.023 - 0.058 mm
Connecting Rod Axial Clearance	0.15 - 0.4 mm

Disassembly

1. Remove the connecting rod cap bolts.
2. Remove the connecting rod bearing cap.

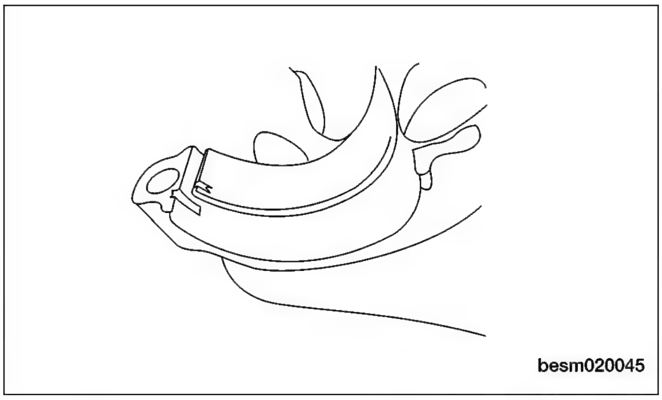


3. Using a hammer handle or similar tool, push the piston and connecting rod assembly (1) out through the cylinder head side of the engine block.



NOTE: Before removing the piston and connecting rod assembly, check the connecting rod side clearance.

4. Remove the connecting rod bearings.



CAUTION: When removing the connecting rod side bearings, note the installation position. Keep them in the correct order.

Inspection

- Check the radial clearance of the connecting rod bearings.

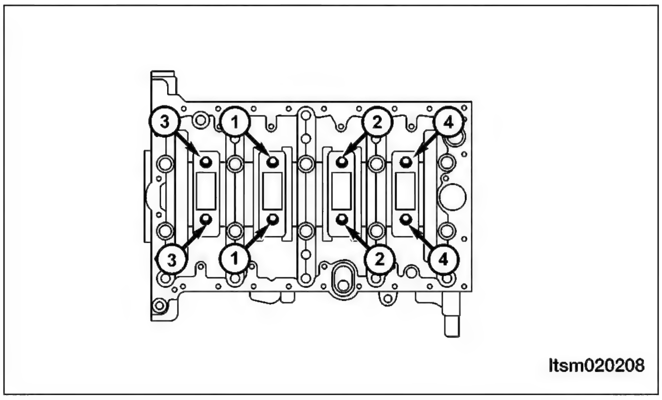
CONNECTING ROD RADIAL CLEARANCE	
Radial Clearance	0.023 - 0.058 mm

Assembly

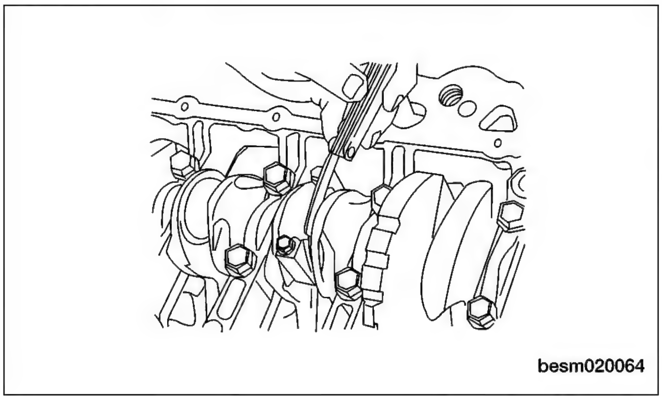
NOTE :

The rod bolts should not be reused.

1. Before installing the NEW rod bolts, the threads and under the bolt head should be oiled with clean engine oil.
2. Install each bolt finger tight, then alternately tighten each bolt to assemble the cap properly.
3. Tighten the connecting rod bolts using the two step torque-turn method:
   - 1st Step: Tighten bolts to 25 ± 3 N·m
   - 2nd Step: Tighten the connecting rod bolts an additional 90 ± 5°



4. Using a feeler gauge, check connecting rod side clearance.
    - Check axial clearance of connecting rod.



Crankshaft

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Main Bearing Cap Bolts	1st Step: Tighten the bolt to 45 ± 5 N·m 2nd Step: Tighten the bolt an additional 180 ± 10°
Lower Cylinder Block Bolts	25 ± 5

Clearance Specifications

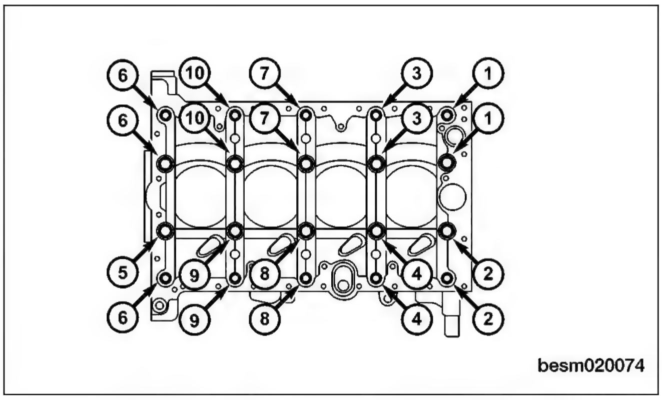
DESCRIPTION	SPECIFICATION (mm)
Diameter of Crankshaft Main Journals	46.01
Diameter of Crankshaft Rod Journals	44.485 - 44.495
Out-of-Round Maximum of Crankshaft Main Journals	0.008
Axial Clearance of Crankshaft	0.02 - 0.30
Radial Clearance of Crankshaft	0.0035 - 0.034
Coaxality Crankshaft Main Journal	0.05
Thrust Washer Thickness	2.4 - 2.405

Disassembly

1. Remove the front crankshaft oil seal (See Front Crankshaft Oil Seal Removal & Installation in Section 02 Engine).
2. Remove the rear crankshaft oil seal (See Rear Crankshaft Oil Seal Removal & Installation in Section 02 Engine).
3. Remove the pistons with connecting rod assemblies.

4. Remove the 20 lower cylinder block bolts in the sequence shown.

   NOTE: Before loosening the lower cylinder block bolts, measure the crankshaft side clearance.



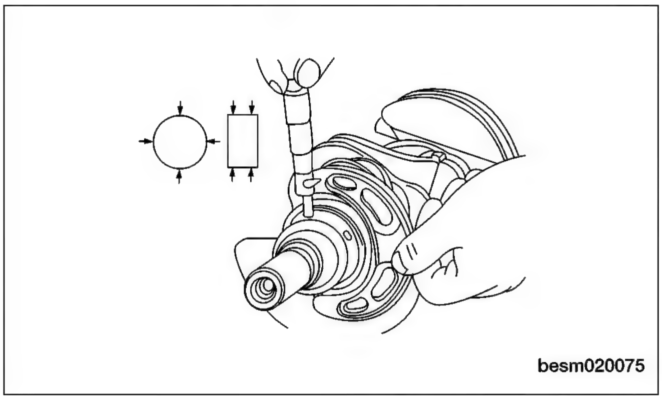
5. Remove the lower cylinder block.
6. Remove the crankshaft.
7. Remove the main bearings and thrust bearings from the upper cylinder block and lower cylinder block.

   NOTE: If reusing the bearings, identify and number the bearings so that they are assembled in the same position and direction.

Inspection

Inspect the crankshaft rod and main journals for the following:

- The crankshaft main journals should be checked for excessive wear, roundness and scoring.
- Main journal limits of roundness should be held to 0.008 mm.
- Rod journal limits of roundness should be held to 0.005 mm.

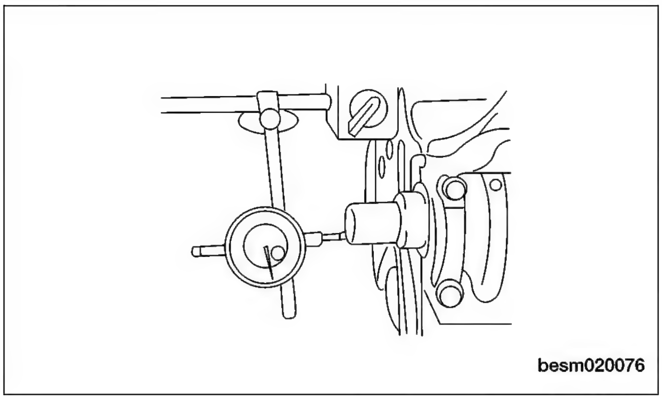


CAUTION:

DO NOT nick the crank journals or bearing fillets.

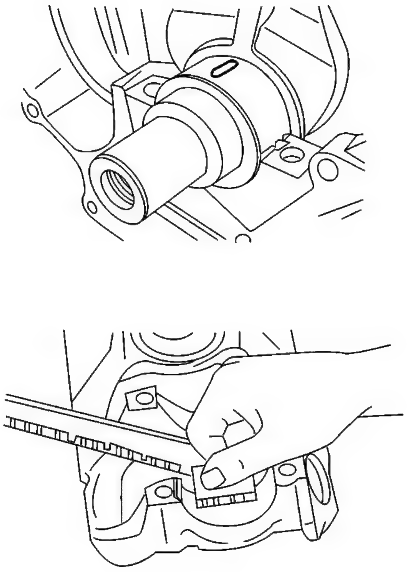
Check the axial clearance after installation:

- Standard axial clearance should be 0.02 mm.
- Limits of axial clearance should be held to 0.30 mm.



Check oil clearance of crankshaft main and rod journals:

- Clean the journal and bearing.
- Install the crankshaft.
- Cut the plastic-gauge to the same width as the bearing, and then put it onto the crankshaft journal to make it parallel with the central line of the crankshaft.
- Install the main bearing cap carefully, and tighten the bolts to the specified torque.
- Remove the main bearing cap.
- Measure the oil clearance with the plastic-gauge.
  - Standard oil clearance of crankshaft rod and main journals should be 0.02 mm
  - Limits of oil clearance of crankshaft rod and main journals should be 0.06 mm



Assembly

1. Install the main bearings and thrust bearings in the upper cylinder block and lower cylinder block.

   NOTE: Identify and number the bearings, if reusing them, so that they are assembled in the same position and direction.
2. Assemble the crankshaft and main bearings in the reverse order of disassembly.

CYLINDER HEAD UNIT REPAIR

Cylinder Head

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Cylinder Head Bolts	1st Step: Tighten the bolt to 50 ± 5 N·m 2nd Step: Tighten the bolt an additional 90 ± 5° 3rd Step: Tighten the bolt an additional 90 ± 5°
Cylinder Head Cover Bolts	8 ± 3

Clearance Specifications

DESCRIPTION	SPECIFICATION (mm)
Cylinder Head Flatness	0.05 - 0.10
Intake Valve Deflection	0.02
Exhaust Valve Deflection	0.04
Spring Height	49.0

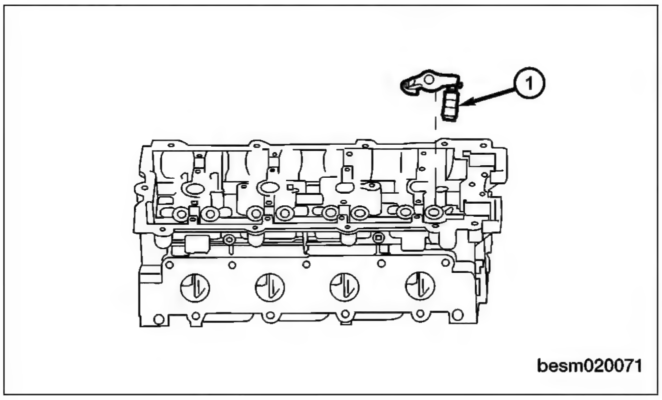
Disassembly

NOTE :
The following special tools are required to perform the repair procedure:

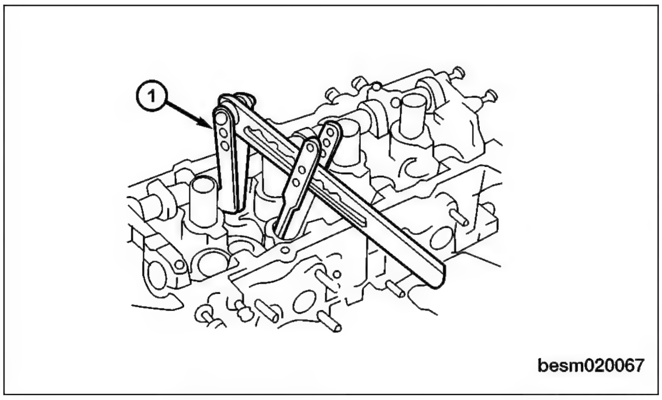
- CH-20018 - Valve Spring Compressor
- CH-20013 - Valve Seal Remover
- CH-20011 - Valve Seal Installer
- CH-20012 - Valve Stem Seal Installer Guide
- CH-20017 - Valve Keeper Installer
- CH-20010 - Camshaft Holder

NOTE :
Replacement cylinder head comes complete with valves, seals, springs, retainers, keepers, tappets, and camshafts.

1. Remove the camshafts (See Camshaft Removal & Installation in Section 02 Engine).
2. Remove the hydraulic tappet assembly (1).



3. Using the special tool CH-20018 (1), compress the valve spring.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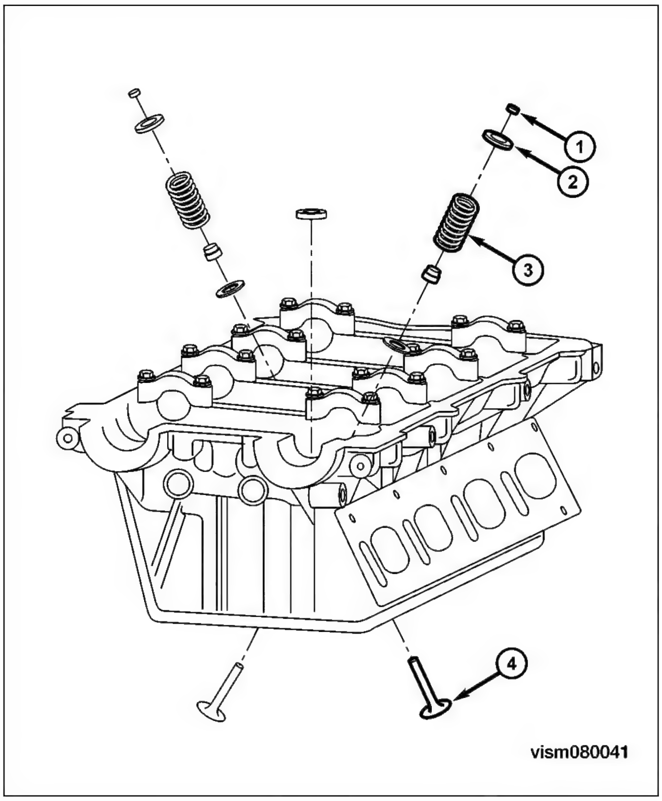
4. Remove the valve keeper (1), valve spring retainer (2) and valve spring (3).
5. Push the valve stem from the cylinder head and remove the valve (4).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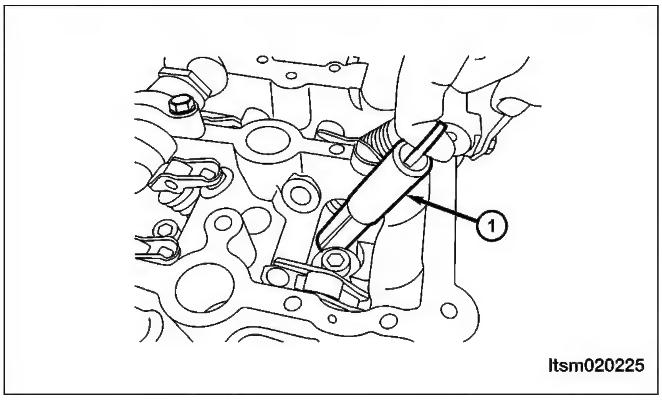
6. Using special tool CH-20013 (1), remove the valve oil seal.
7. Remove the valve guide if necessary.
8. Remove the spark plugs.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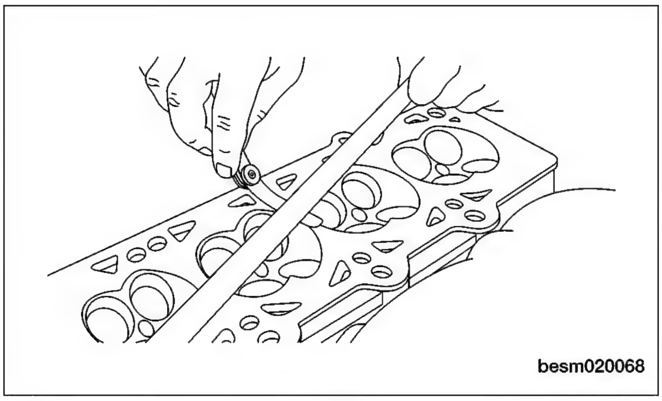
Inspection

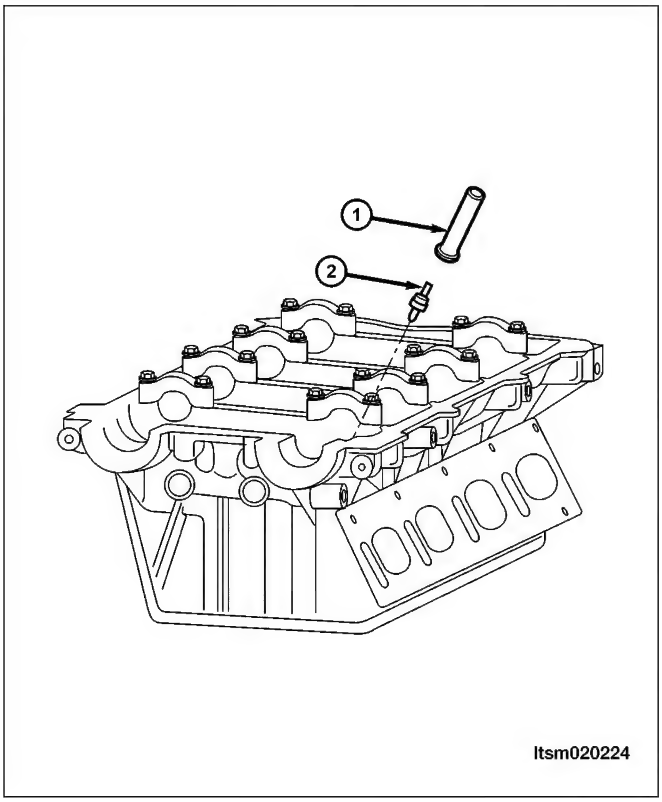
Inspect the cylinder head for the following:

- Cylinder head must be flat within 0.05 - 0.10 mm.
- Inspect camshaft bearing journals for scoring.
- Remove carbon and varnish deposits from inside of valve guides with a valve guide cleaner.
- Verify the valve tappets move freely in their bores, and that they have been rotating.
- Check the valve guide height.



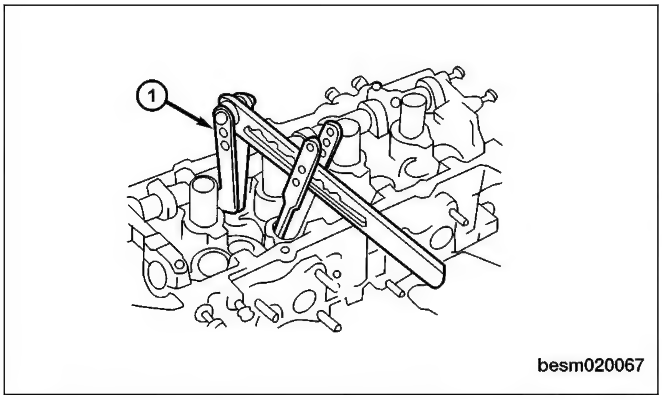
Assembly

1. Install new valve guide if necessary.
2. Install new valve seat if necessary.
3. Using special tool CH-20011 (1) & CH-20012 (2), install the new valve oil seal.



4. Install the valves into the cylinder head (larger diameter on intake side).
5. Install the valve springs.
6. Install the valve spring retainers.

7. Using a valve spring compressor CH-20018 (1), compress the valve springs.
8. Install the valve keepers.



9. Strike the valve stem lightly with a plastic hammer after installation to verify proper assembly.
10. Install valve tappets in the head.
11. Install the camshafts.

Installation Notes:

- Coat the valve oil seals with engine oil.

Camshaft

Specifications

Camshaft Specifications

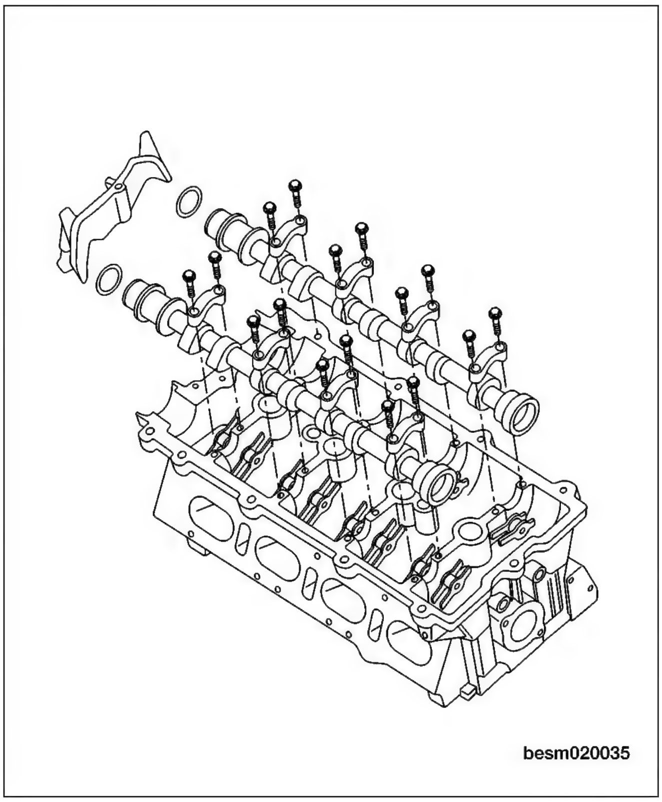
DESCRIPTION	SPECIFICATION (mm)
Intake Cam Lobe Height	37.11
Exhaust Cam Lobe Height	37.09
Journal #1 Outer Diameter	31.934 - 31.95
Journal #2, #3, #4, #5, Outer Diameter	23.947 - 23.96
Cam Bearing #1 Inner Diameter	32 - 32.025
Cam Bearing #2, #3, #4, #5, Inner Diameter	24 - 24.021
Journal #1 Clearance	0.05 - 0.090
Journal #2, #3, #4, #5 Clearance	0.04 - 0.074
Intake Camshaft Axial Clearance	0.15 - 0.20
Exhaust Camshaft Axial Clearance	0.15 - 0.20

Disassembly

1. Remove the camshaft bearing cap bolts.

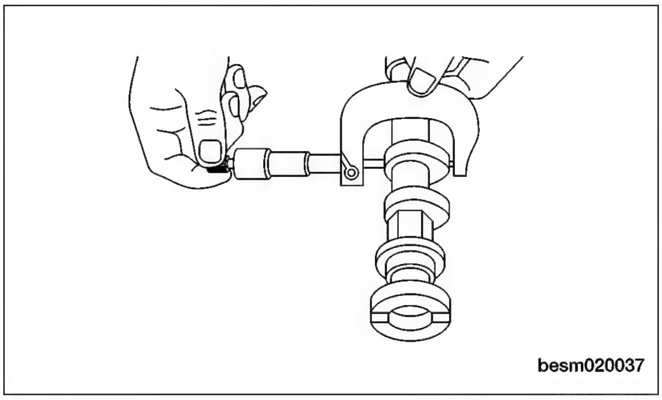
   NOTE: Equally loosen camshaft bearing cap bolts in several steps.
2. Remove the camshaft bearing caps and place them in proper order.

   NOTE: The camshaft bearing caps are marked for identification.
3. Remove the camshafts and then remove the camshaft seals.



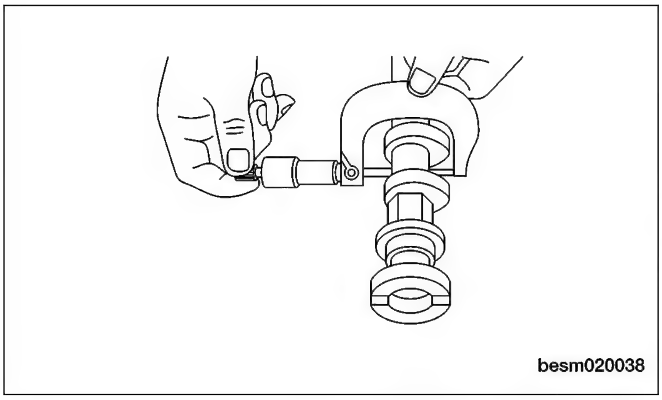
Inspection

- Measure the camshaft cam lobe height.
- If wear is beyond the limit, replace the camshaft.



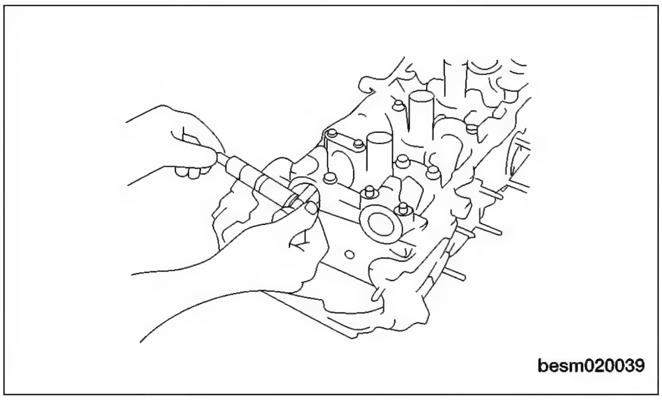
CAMSHAFT CAM LOBE HEIGHT	
Intake Cam Lobe Height	37.11 mm
Exhaust Cam Lobe Height	37.09 mm

- Measure the outer diameter of the camshaft journal.



OUTER DIAMETER OF CAMSHAFT JOURNAL	
Journal #1 Outer Diameter	31.934 - 31.95 mm
Journal #2, #3, #4, #5, Outer Diameter	23.947 - 23.96 mm

- Measure the inner diameter of the camshaft bearing.



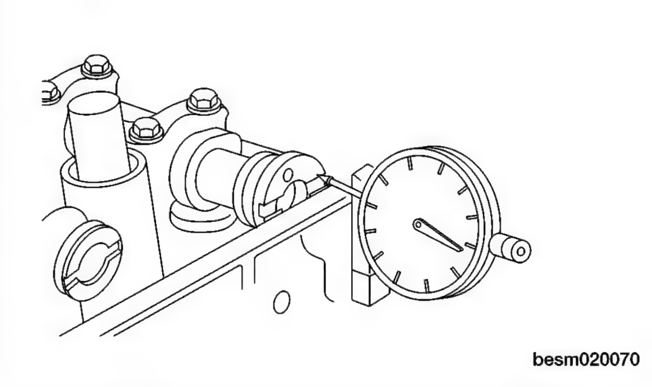
INNER DIAMETER OF CAMSHAFT BEARING	
Cam Bearing #1 Inner Diameter	32 - 32.025 mm
Cam Bearing #2, #3, #4, #5, Inner Diameter	24 - 24.021 mm

- Calculation of camshaft journal clearance

Journal clearance = (inner diameter of camshaft bearing) - (outer diameter of camshaft journal)

CAMSHAFT JOURNAL CLEARANCE	
Journal #1 Clearance	0.05 - 0.090 mm
Journal #2, #3, #4, #5 Clearance	0.04 - 0.074 mm

- Measure the axial clearance of camshaft.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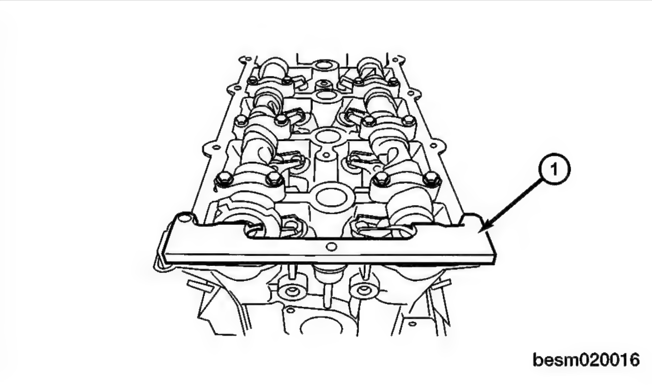
CAMSHAFT AXIAL CLEARANCE	
Intake Camshaft	0.15 - 0.20 mm
Exhaust Camshaft	0.15 - 0.20 mm

Assembly

1. Using special tool CH-20010 (1), install the camshaft holder to hold the camshafts in place.

NOTE :
The camshaft holder will prevent the camshafts from rotating in either direction.



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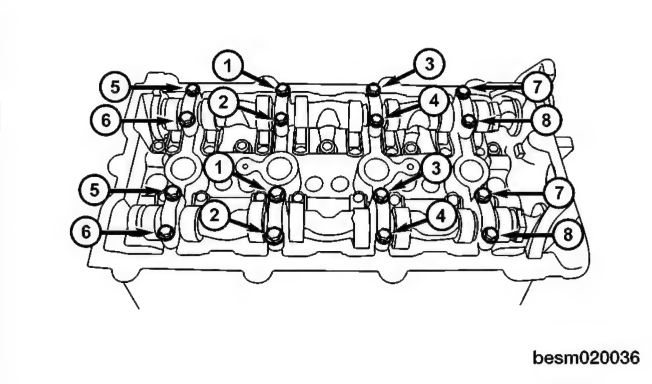
2. Installation is in the reverse order of removal.

Installation Notes:

- Install the intake and exhaust camshaft bearing caps in the proper order.
- Slowly tighten bolts to the specified torque.
- Follow the torque sequence as shown.



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Valve & Valve Guides

Specifications

Valve & Valve Guide Specifications

DESCRIPTION	SPECIFICATION (mm)
Intake Valve Deflection	0.02
Exhaust Valve Deflection	0.04
Intake Valve Guide Clearance	0.012 - 0.043
Exhaust Valve Guide Clearance	0.032 - 0.063

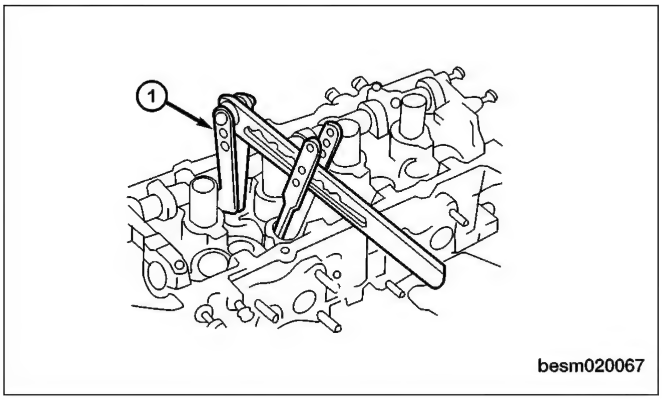
DESCRIPTION		SPECIFICATION (mm)
Valve Outer Diameter	Intake Valve	5.98 ± 0.008
	Exhaust Valve	5.98 ± 0.008
Valve Guide Inner Diameter	Intake Valve	5.4 ± 0.1
	Exhaust Valve	5.4 ± 0.1
Fringe Thickness On Top Of Valve	Intake Valve	0.3 ± 0.15
	Exhaust Valve	0.3 ± 0.15
Valve Tilt Angle	Intake Valve	65°
	Exhaust Valve	68°
Valve Height	Intake Valve	107.998
	Exhaust Valve	106.318

Disassembly

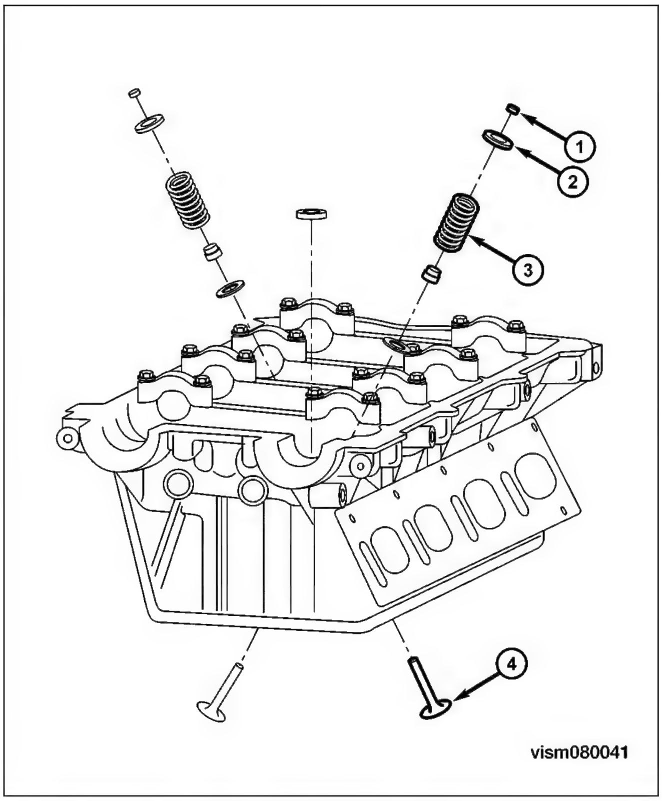
NOTE :
The following special tools are required to perform the repair procedure:

- CH-20018 - Valve Spring Compressor
- CH-20013 - Valve Seal Remover
- CH-20011 - Valve Seal Installer
- CH-20012 - Valve Stem Seal Installer Guide
- CH-20017 - Valve Keeper Installer

1. Using the special tool CH-20018 (1), compress the valve springs.



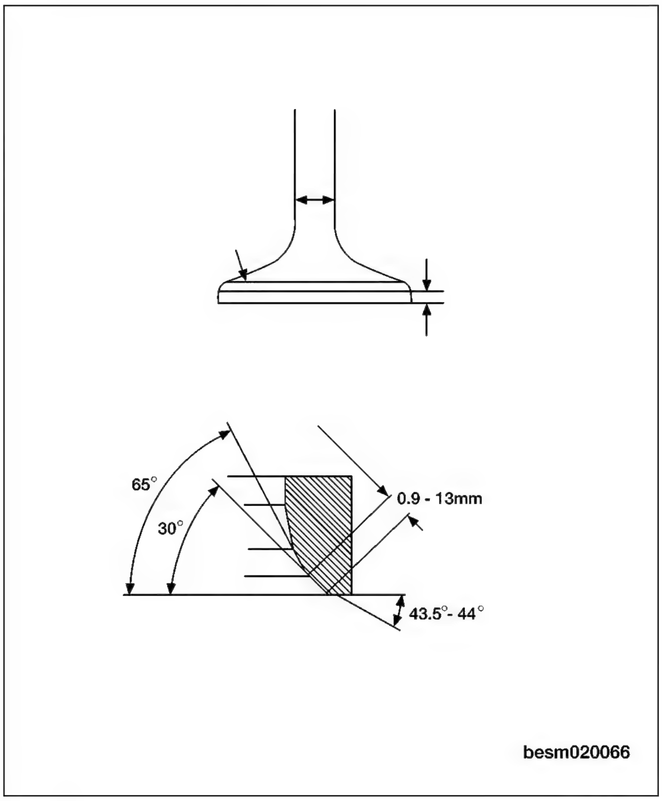
2. Remove the valve keeper (1), valve spring retainer (2) and valve spring (3).
3. Remove valves (4) from the cylinder head.



Inspection

Inspect the valves for the following:

- Clean all valves thoroughly and discard burned, warped and cracked valves.
- Check valve seats and valve faces for damage.
- When reconditioning valves follow the specifications outlined for both intake and exhaust valves.

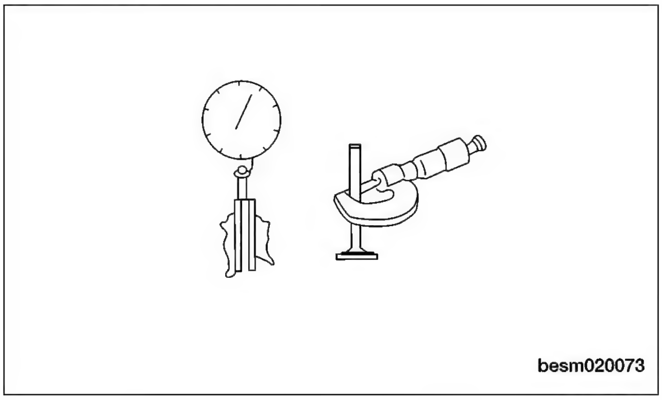


ITEM		SPECIFICATION (mm)
Valve Outer Diameter	Intake Valve	5.98 ± 0.008
	Exhaust Valve	5.98 ± 0.008
Valve Guide Inner Diameter	Intake Valve	5.4 ± 0.1
	Exhaust Valve	5.4 ± 0.1
Fringe Thickness On Top Of Valve	Intake Valve	0.3 ± 0.15
	Exhaust Valve	0.3 ± 0.15
Valve Tilt Angle	Intake Valve	65°
	Exhaust Valve	68°
Valve Height	Intake Valve	107.998
	Exhaust Valve	106.318

- Measure valve deflection.

VALVE DEFLECTION LIMIT (DIAL GAUGE READING)	
Intake Valve	0.02 mm
Exhaust Valve	0.04 mm

- If it exceeds the limit, check valve to valve guide clearance.
  - Measure valve stem diameter and valve guide inner diameter.
  - Check that clearance is within specification.
  - If it exceeds the limit, replace valve or valve guide.

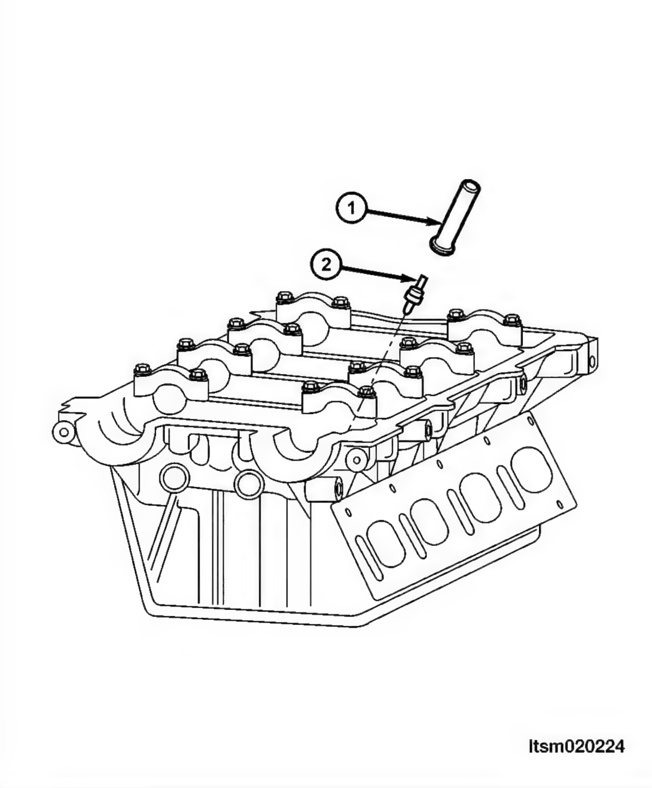


VALVE TO VALVE GUIDE CLEARANCE STANDARD	
Intake Valve	0.012 - 0.043 mm
Exhaust Valve	0.032 - 0.063 mm

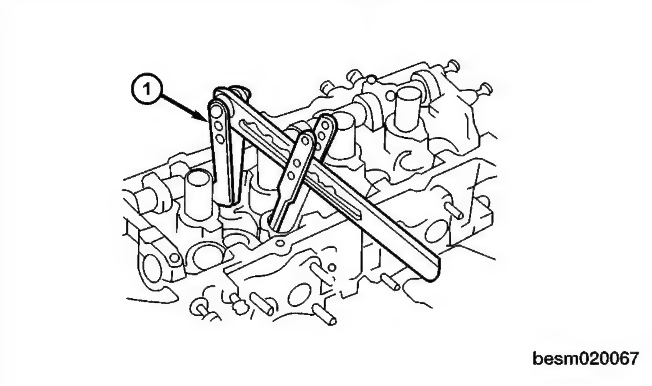
Assembly

1. Install the valves into the cylinder head (larger diameter on intake side).

2. Using special tool CH-20011 (1) & CH-20012 (2), install the new valve oil seal.



3. Install the valve springs.
4. Install the valve spring retainers.
5. Using valve spring compressor CH-20018 (1), compress the valve springs.
6. Install the valve keepers.



7. Strike the valve stem lightly with a plastic hammer after installation to verify proper assembly.

Valve Springs

Specifications

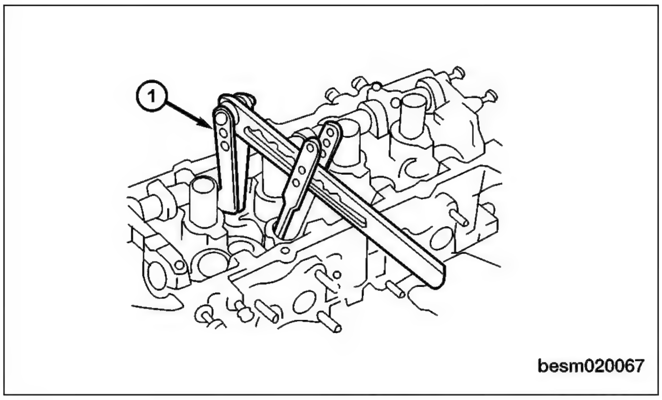
Valve Spring Specifications

DESCRIPTION	SPECIFICATION
Spring Free Length	49 mm
Spring Height At 620 Newtons Of Pressure	32.0 mm

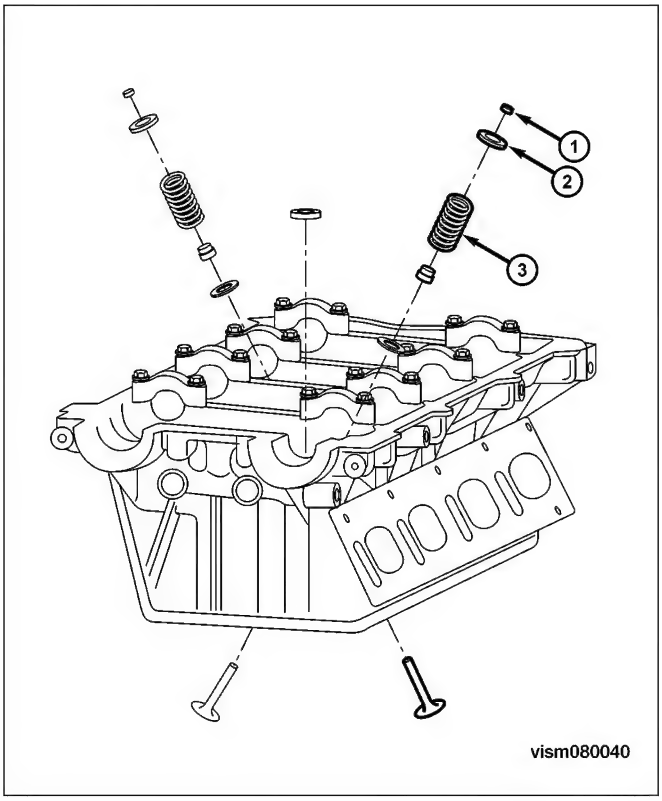
Disassembly

NOTE :
The following special tools are required to perform the repair procedure:
- CH-20018 - Valve Spring Compressor
- CH-20013 - Valve Seal Remover
- CH-20011 - Valve Seal Installer
- CH-20012 - Valve Stem Seal Installer Guide
- CH-20017 - Valve Keeper Installer

1. Using the special tool CH-20018 (1), compress the valve springs.

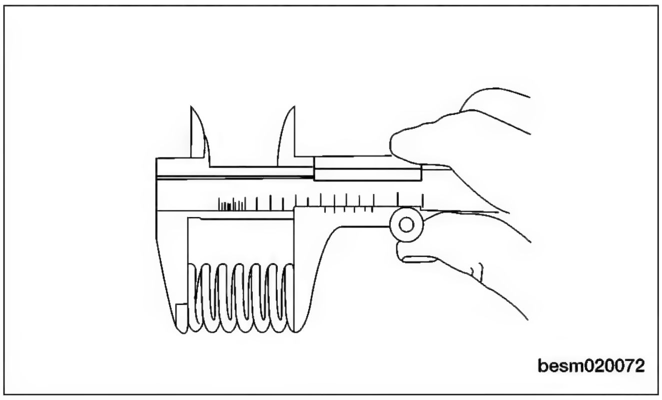


2. Remove the valve keeper (1), and the valve spring retainer (2).
3. Remove the valve springs (3) from the cylinder head.



Inspection

- Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested for correct load.
- Discard the springs that do not meet specifications.
- The following specifications apply to both intake and exhaust valve springs.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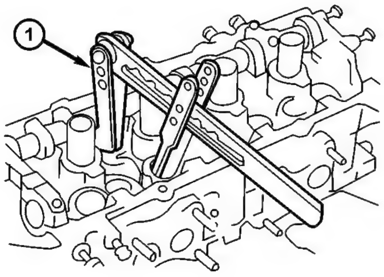
VALVE SPRING LENGTH/HEIGHT	
Spring Free Length	49 mm
Spring Height At 620 Newtons Of Pressure	32.0 mm

If it is not within specifications, replace the valve spring.

Assembly

1. Install the valve springs.
2. Install the valve spring retainers.
3. Using a valve spring compressor CH-20018 (1), compress the valve springs.
4. Install the valve keepers.



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5. Strike the valve stem lightly with a plastic hammer after installation to verify proper assembly.

ELECTRONIC ENGINE CONTROLS

03

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GENERAL INFORMATION

Description

The Engine Control Module (ECM) controls the engine management system. The ECM can adjust for varying driving conditions and modify fuel and ignition requirements as needed to maintain optimum performance and economy.

The following are the input and output components monitored by the ECM.

ECM Inputs

- Brake Switch Sensor
- A/C Pressure Sensor
- Refrigerant Pressure Sensor
- Camshaft Position (CMP) Sensor
- Crankshaft Position (CKP) Sensor
- Engine Coolant Temperature (ECT) Sensor
- Manifold Absolute Pressure (MAP) Sensor
- Throttle Position Sensor (integral with Electronic Throttle Control Actuator)
- Power Steering Switch
- Accelerator Pedal Position (APP) Sensor
- Knock Sensor
- Upstream Oxygen Sensor
- Downstream Oxygen Sensor
- Vehicle Speed Sensor
- Clutch Pedal Switch

ECM Outputs

- Canister Control Valve
- Fuel Injectors
- Fuel Pump Relay
- Electronic Throttle Control Actuator
- Ignition Coil
- A/C Compressor
- Cooling Fan
- Oxygen Sensor Heater (Upstream & Downstream)

Operation

The ECM monitors components and circuits and tests them in various ways depending on the hardware, function, and type of signal. For example, analog inputs such as throttle position or engine coolant temperature are typically checked for opens, shorts and out-of-range values. This type of monitoring is carried out continuously. Some digital inputs like vehicle speed or crankshaft position rely on rationality checks - checking to see if the input value makes sense at the current engine operating conditions. These types of tests may require monitoring several components and can only be carried out under appropriate test conditions.

The ECM is a pre-programmed, microprocessor-based digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The ECM can adapt its programming to meet changing operating conditions.

Electronic Engine Control Input & Output Device Failure Modes

NUMBER	ITEM	FAILURE MODE	CORRECTION
1	CKP	• Engine is hard to start. • The engine RPM will be limited after the engine starts. • The highest RPM is less than 3800. • Excessive exhaust emissions. • No ignition signal to the ECM. • The tachometer does not work. • Rough engine operation.	Replace
2	CMP	• The fuel injector ON time may vary from 720 degrees to 360 degrees. • The sensor output is not correct, the MIL light will turn on after the engine starts. • Engine is hard to start. • The highest RPM is less than 4000.	Replace
3	APPS	• The MIL light will turn on. • Poor acceleration. • The engine RPM will be limited after the engine starts.	Replace
4	ECT	• Engine hard to start when cold. • Engine hard to start when hot. • Poor driving capability. • If the sensor circuit is shorted to power, the engine will run under the default values. • The temperature gauge indicates too high. • The temperature gauge indicates too low. • The cooling fan operates continuously on high speed. • The high temperature warning lamp will flash when the IP indicates low temperature.	Replace
5	MAF	• The cooling fan will operate for approximately 60 seconds on high speed after the ignition switch is turned off. • Poor acceleration. • Poor driving capability.	Replace
6	O_2 Sensor	• Poor fuel economy. • Excessive exhaust emissions. • Sluggish acceleration. • Poor driving capability.	Replace
7	Knock Sensor	• The engine produces an engine knock. • Overheated engine. • Excessive exhaust emissions. • Poor fuel economy. • Lack of engine power. • Internal engine damage.	Replace
8	ECM	• Unstable engine idle. • Poor acceleration. • Unable to start. • High engine idle. • The engine exhaust exceeds emission standards. • Engine is hard to start. • Air conditioner does not operate. • Fuel injector control failure. • Engine stalls out.	Replace
9	Ignition Coil	• Unstable idle. • Lack of engine power. • Poor fuel economy. • Excessive exhaust emissions. • Weak spark.	Replace

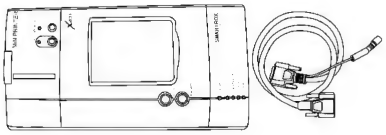
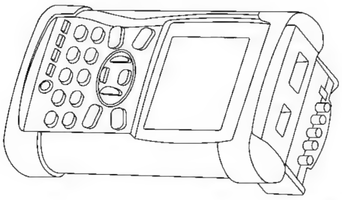
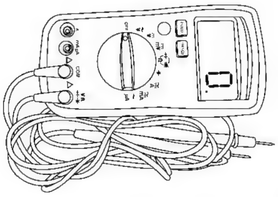
NUMBER	ITEM	FAILURE MODE	CORRECTION
10	Fuel Injector	• Unstable idle. • Lack of engine power. • Poor acceleration. • Engine will not start. • Plugged injector.	Replace
11	TPS	• Poor acceleration. • The MIL light will turn on.	Replace
12	EVAP	• The engine base fuel closed-loop control self-learning will be shut off. • The engine idle air control self-learning will be shut off. • Unstable idle or high idle.	Replace
13	Fuel Pump	• Noisy fuel pump operation. • Poor acceleration. • Engine will not start.	Replace
14	MAP	• Poor acceleration. • Unstable idle. • Rough engine operation.	Replace
15	IAT	• Intake air temperature will be equal to the coolant temperature.	Replace
16	Cooling Fan	• High engine temperature. • Poor air conditioner performance.	Replace
17	Accelerator Sensor	• Misfire • Poor driving capability. • Rough engine operation.	Replace

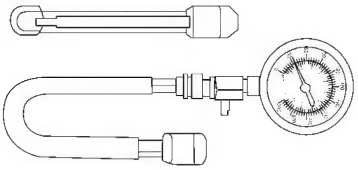
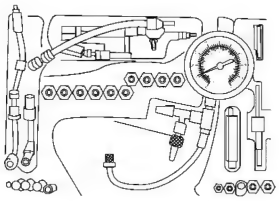
Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Engine Coolant Temperature (ECT) Sensor	20
Knock Sensor	20
Oxygen Sensors	45
Crankshaft Position (CKP) Sensor	10
Camshaft Position (CMP) Sensor	7
Air Flow Sensor Bolts	5
Engine Control Module (ECM) Bolts	6
Accelerator Pedal Position (APP) Sensor	11
Electronic Throttle Control Actuator	10
Vehicle Speed Sensor	10
Manifold Absolute Pressure (MAP) Sensor	6

Special Tools

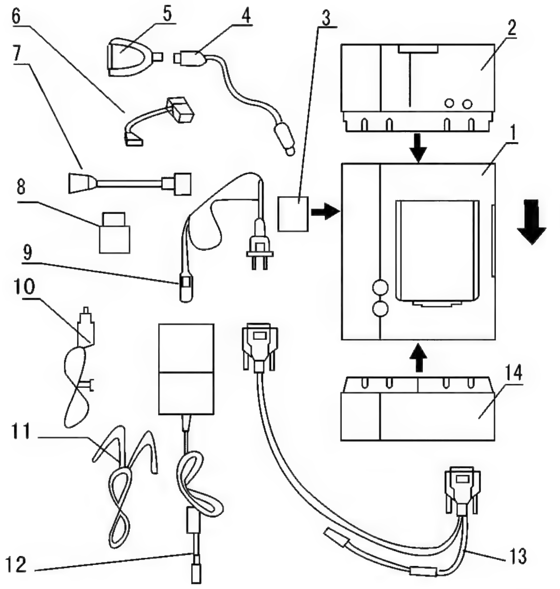
Diagnostic Scan Tool X-431	 besm030001
Engine Analyzer KES-200	 ltsmd030069
Digital Multimeter Fluke 15B & 17B	 besm030002

Compression Gauge	 besm030009
Fuel Pressure Gauge	 besm030008

Hardware Requirements

The hardware configuration of X-431 is as follows:

Diagnostic Scan Tool Configuration



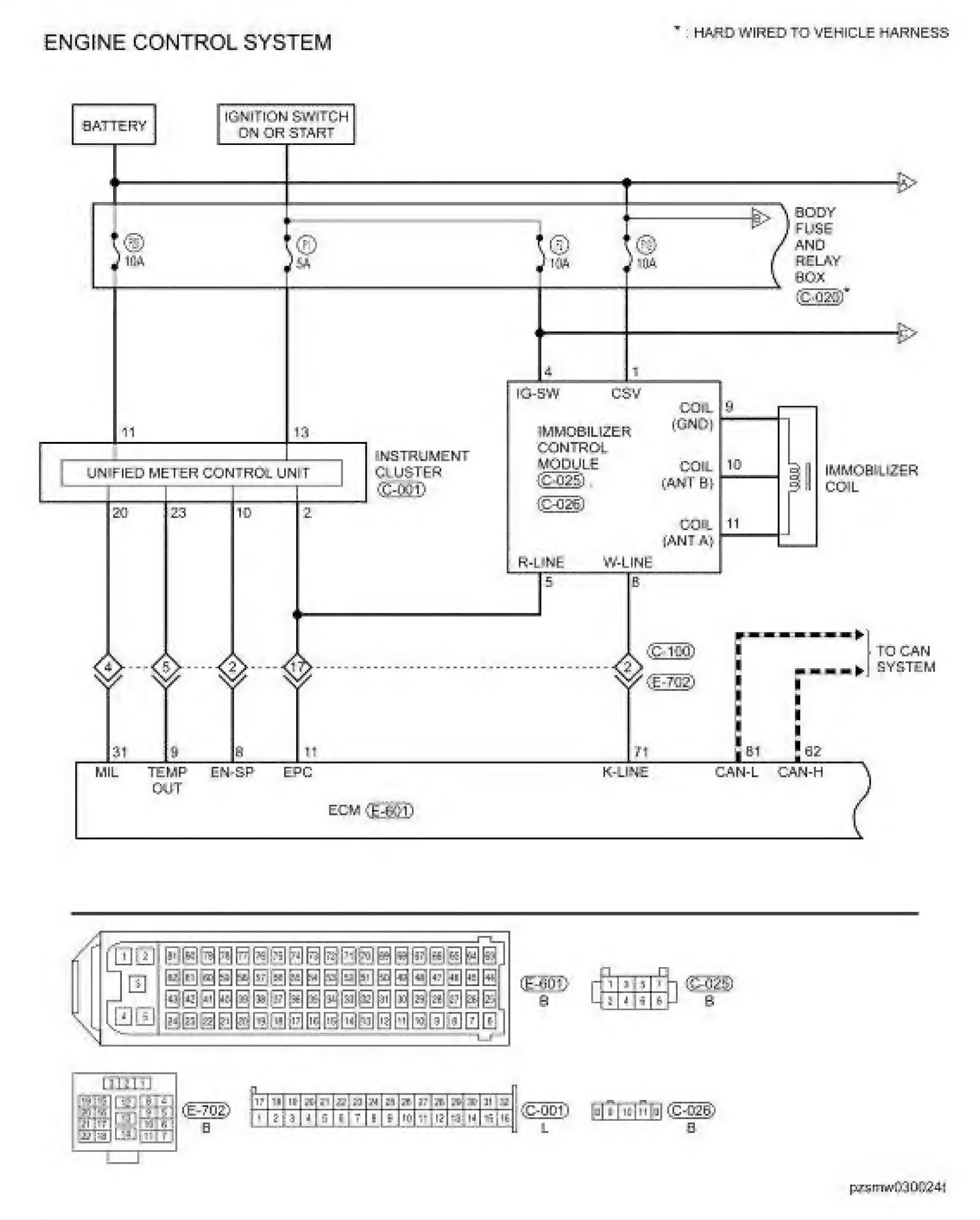
besm030003

ITEM	NAME	FUNCTION
1	X-431 Main Unit	To Display Operational Buttons, Test Results, Help Information, etc.
2	Mini-Printer	To Print Test Results. (Optional)
3	CF Card	To Store Diagnostic Software and Data
4	USB Cable	To Connect CF Card Reader/Writer and Computer
5	CF Card Reader/Writer	To Read or Write Data On The CF Card
6	Mitsubishi-12+16 Pin Connector	To Diagnose Mitsubishi Electronic Control Systems On Chery A1 Series
7	Fiat-3 Pin Connector	To Diagnose Vehicles With Fiat-3 Pin Diagnostic Connector

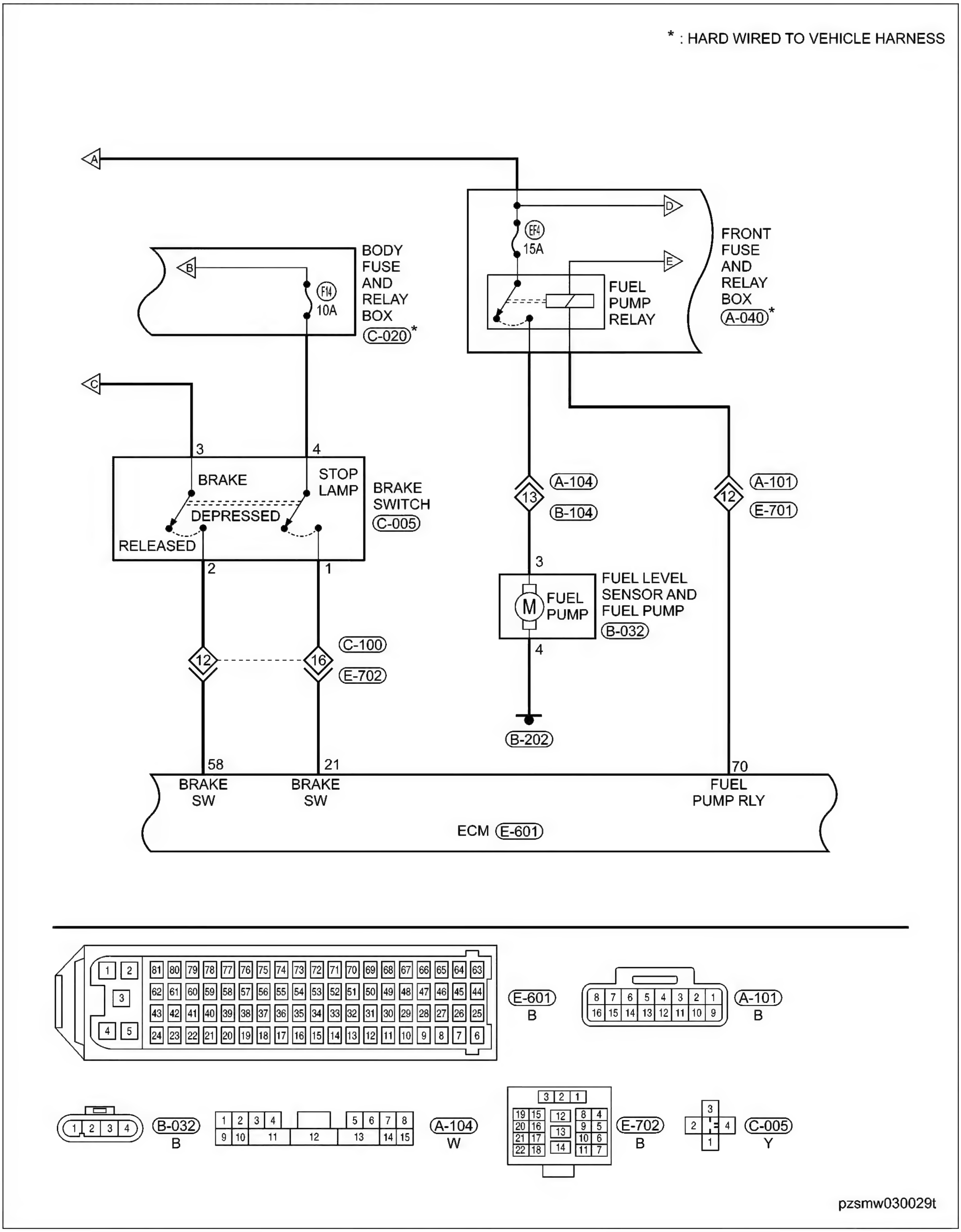
ITEM	NAME	FUNCTION
8	Smart OBDII-16 Pin Connector	To Diagnose Other Systems Of Vehicle With OBDII-16 Pin Diagnostic Connector
9	Power Cord	To Connect AC 100 - 240 V Outlet and Power Adapter
10	Cigarette Lighter Cable	To Get Power From Vehicle Cigarette Lighter
11	Battery Cable W/Two Clips	To Get Power From Vehicle Battery
12	Power Adapter	To Convert 100 - 240 V AC Power Into 12 V DC Power
13	Main Cable	To Connect The Diagnostic Connector and Smartbox
14	Smartbox	To Perform Vehicle Diagnosis

Electrical Schematics

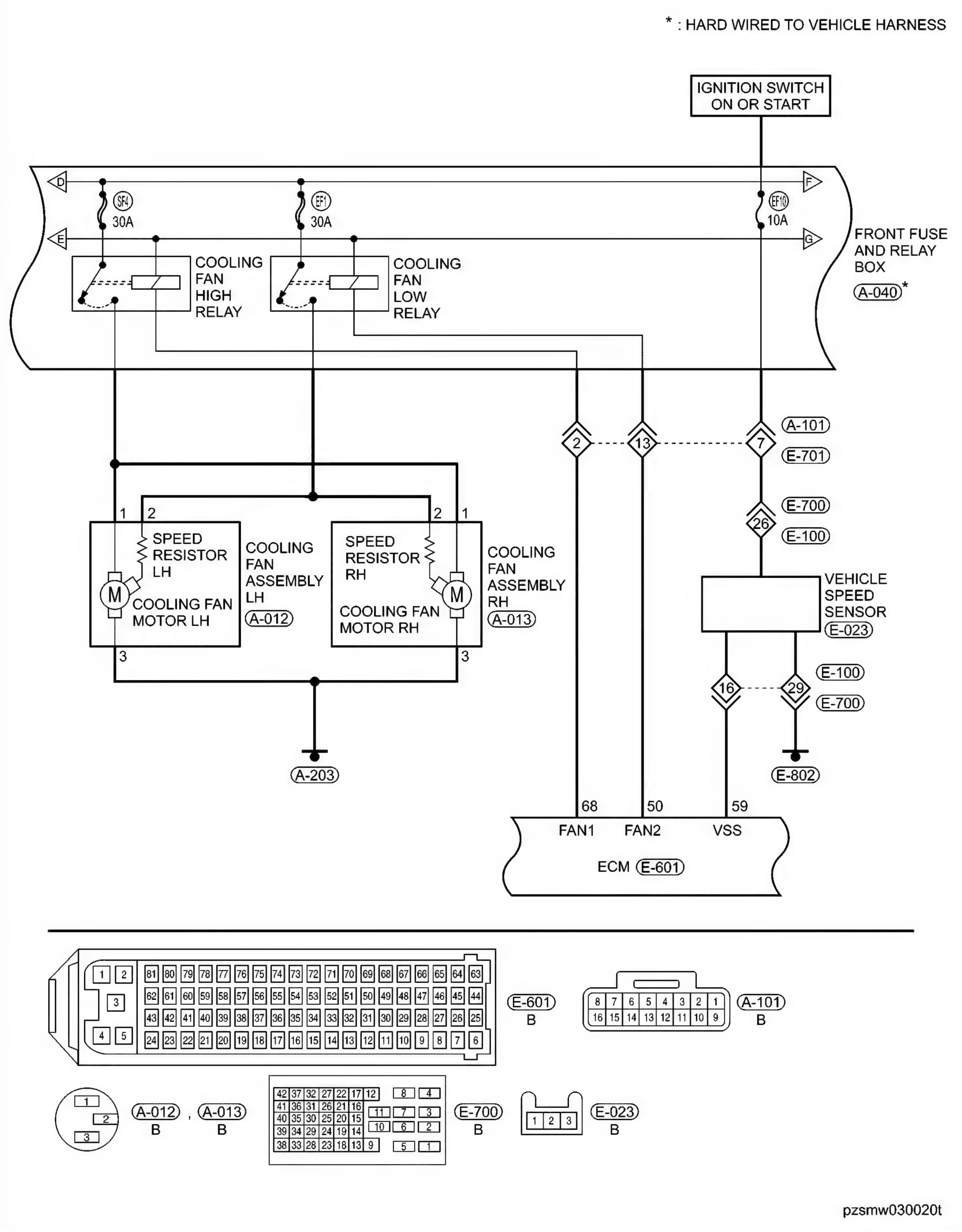
Electronic Engine Controls (Page 1 of 11)


ENGINE CONTROL SYSTEM
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
A
B
C
10A
F1
5A
10A
10A
BODY FUSE AND RELAY BOX
C-020*
4
1
IG-SW
CSV
COIL (GND)
9
IMMOBILIZER CONTROL MODULE
C-025
C-026
COIL (ANT B)
10
COIL (ANT A)
11
IMMOBILIZER COIL
R-LINE
W-LINE
5
8
11
13
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
20
23
10
2
4
5
2
17
2
C-100
E-702
TO CAN SYSTEM
31
9
8
11
71
81
62
MIL
TEMP OUT
EN-SP
EPC
K-LINE
CAN-L
CAN-H
ECM
E-601
E-601
B
C-025
B
E-702
B
C-001
L
C-026
B
pzsmw030024t

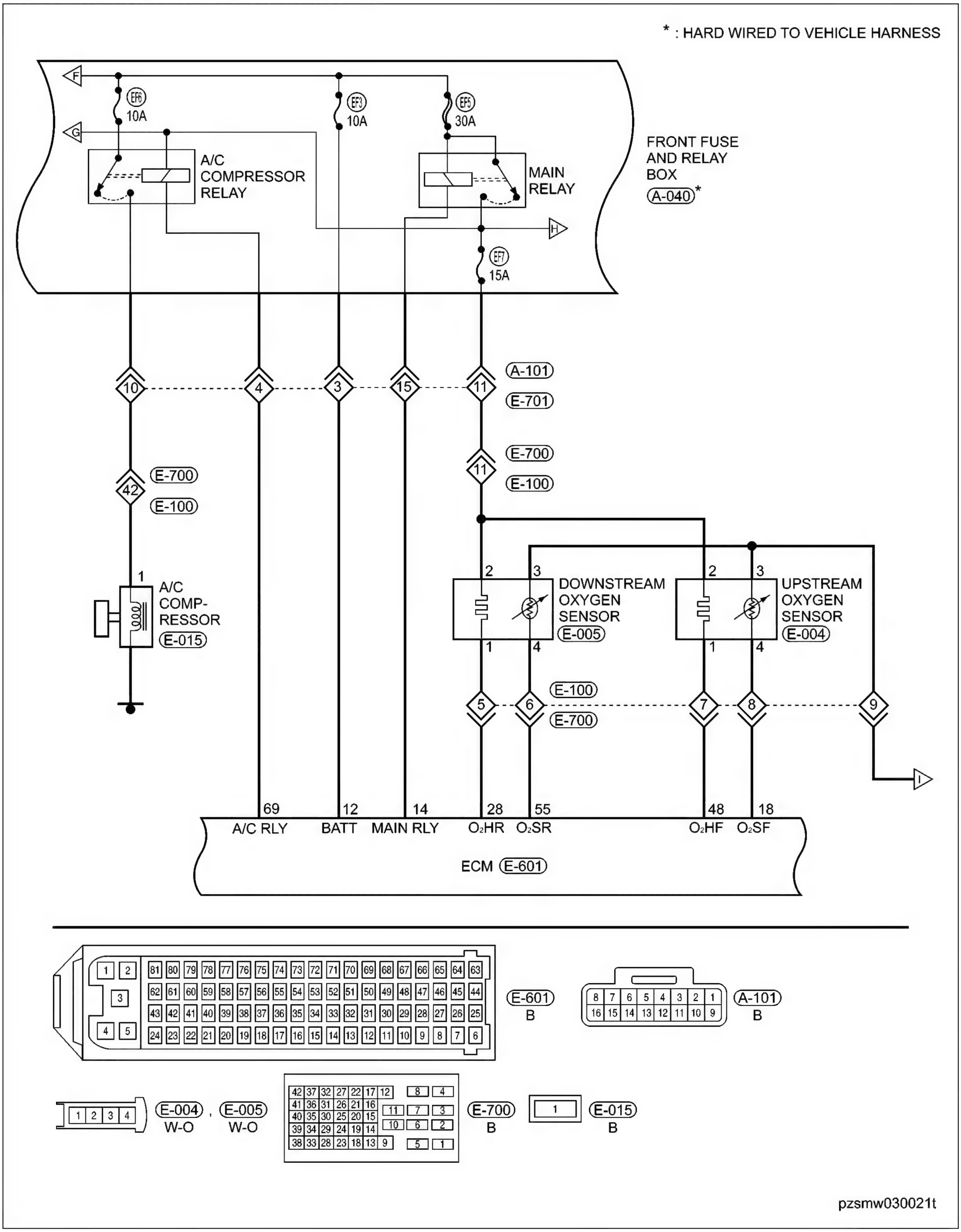
Electronic Engine Controls (Page 2 of 11)


* : HARD WIRED TO VEHICLE HARNESS
A
D
E
EF4
15A
FUEL PUMP RELAY
FRONT FUSE AND RELAY BOX
A-040*
B
F14
10A
BODY FUSE AND RELAY BOX
C-020*
C
3
4
BRAKE
STOP LAMP
DEPRESSED
RELEASED
BRAKE SWITCH
C-005
2
1
13
A-104
B-104
12
A-101
E-701
3
M
FUEL PUMP
FUEL LEVEL SENSOR AND FUEL PUMP
B-032
4
12
16
C-100
E-702
B-202
58
BRAKE SW
21
BRAKE SW
70
FUEL PUMP RLY
ECM E-601
E-601
B
A-101
B
B-032
B
A-104
W
E-702
B
C-005
Y
pzsmw030029t

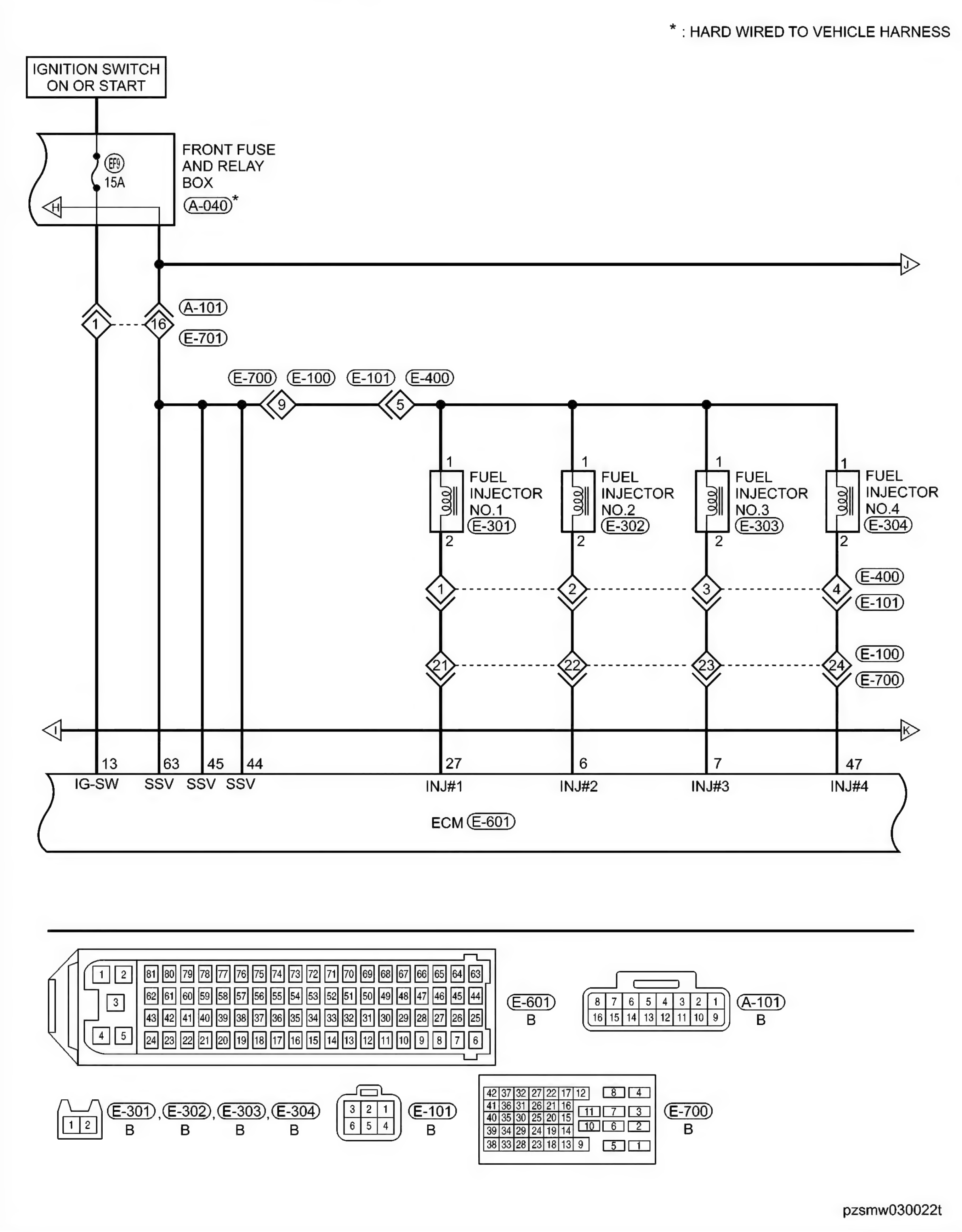
Electronic Engine Controls (Page 3 of 11)


* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
D
E
F
G
SF4
30A
EF1
30A
EF10
10A
COOLING FAN HIGH RELAY
COOLING FAN LOW RELAY
FRONT FUSE AND RELAY BOX
A-040*
A-101
E-701
2
13
7
E-700
26
E-100
1
2
2
1
SPEED RESISTOR LH
COOLING FAN MOTOR LH
M
COOLING FAN ASSEMBLY LH
A-012
SPEED RESISTOR RH
COOLING FAN MOTOR RH
M
COOLING FAN ASSEMBLY RH
A-013
3
3
A-203
VEHICLE SPEED SENSOR
E-023
16
29
E-100
E-700
E-802
68
50
59
FAN1
FAN2
VSS
ECM E-601
E-601
B
A-101
B
A-012, A-013
B
E-700
B
E-023
B
pzsmw030020t

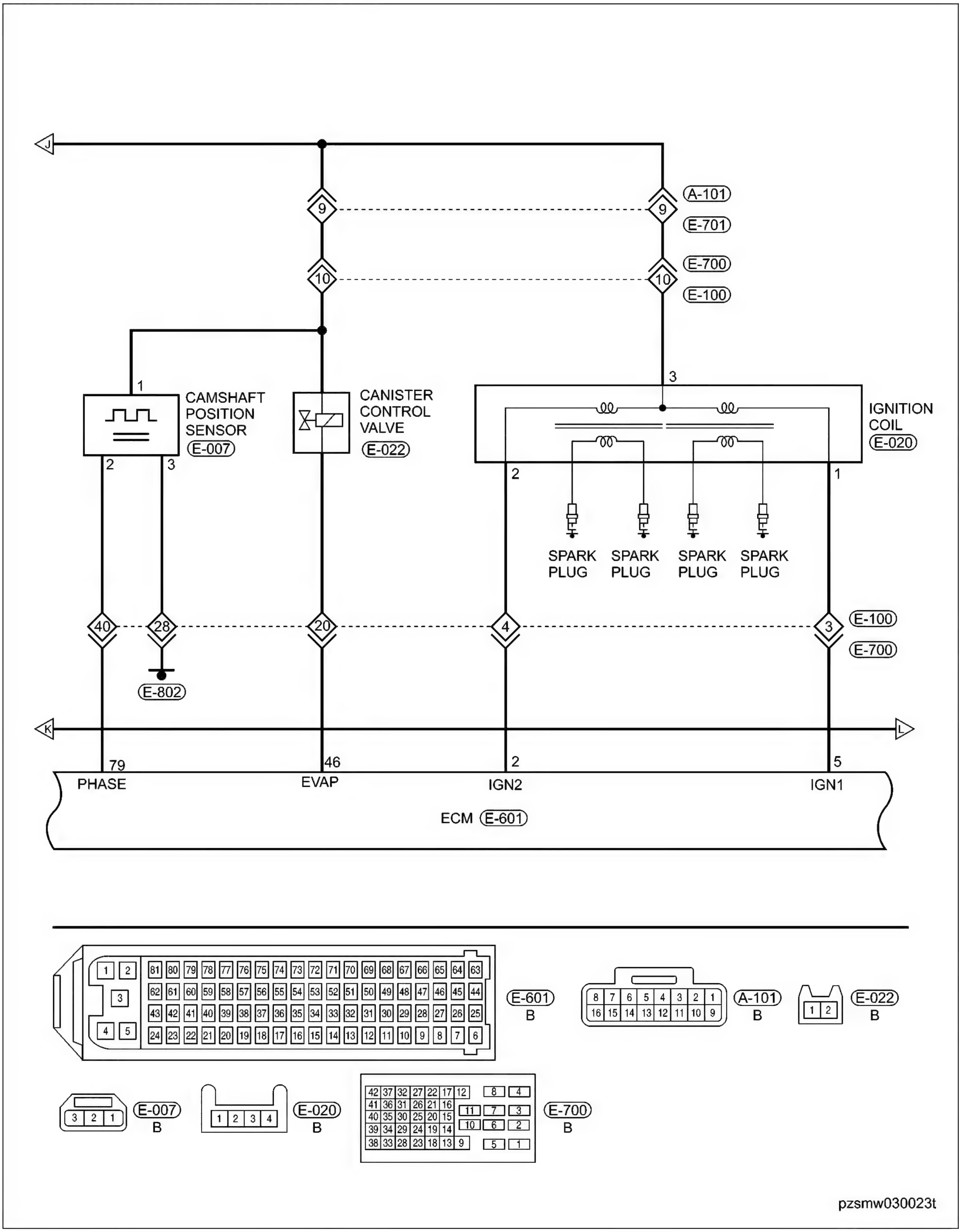
Electronic Engine Controls (Page 4 of 11)


* : HARD WIRED TO VEHICLE HARNESS
F
G
H
I
EF6 10A
EF3 10A
EF5 30A
EF7 15A
A/C COMPRESSOR RELAY
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
10
4
3
15
11
A-101
E-701
E-700
E-100
42
1
A/C COMP-RESSOR
E-015
2
3
DOWNSTREAM OXYGEN SENSOR
E-005
UPSTREAM OXYGEN SENSOR
E-004
1
4
5
6
7
8
9
69
12
14
28
55
48
18
A/C RLY
BATT
MAIN RLY
O₂HR
O₂SR
O₂HF
O₂SF
ECM E-601
E-601 B
A-101 B
E-004 W-O
E-005 W-O
E-700 B
E-015 B
pzsmw030021t

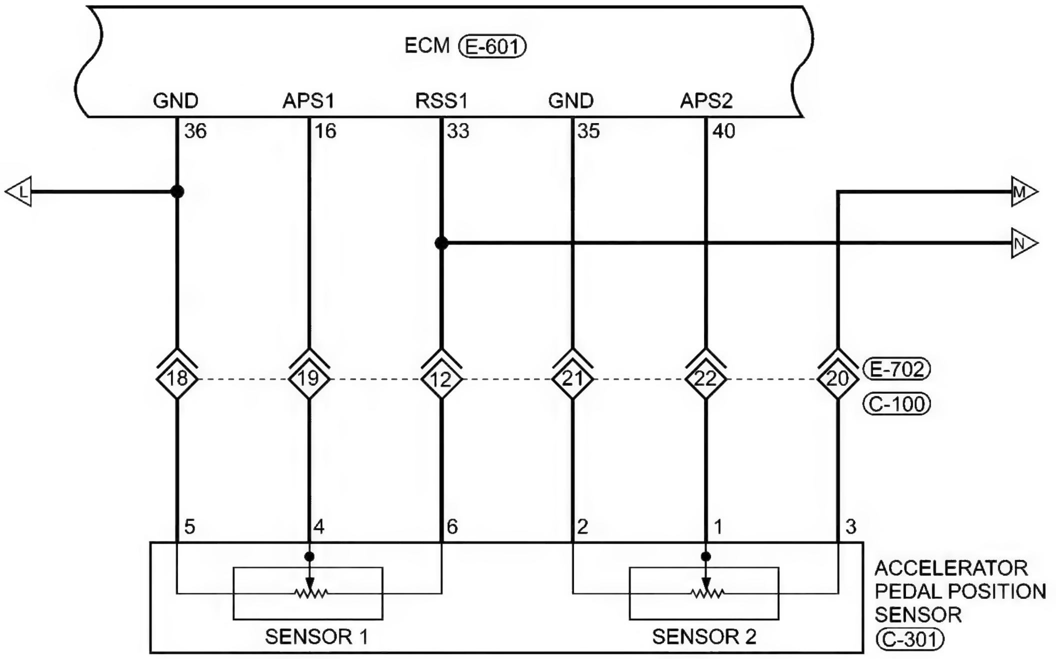
Electronic Engine Controls (Page 5 of 11)

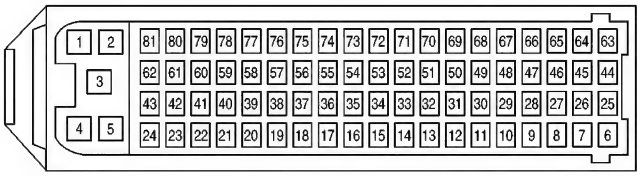

* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
EF9 15A
FRONT FUSE AND RELAY BOX
A-040*
H
J
1
16
A-101
E-701
E-700
E-100
E-101
E-400
9
5
FUEL INJECTOR NO.1 E-301
FUEL INJECTOR NO.2 E-302
FUEL INJECTOR NO.3 E-303
FUEL INJECTOR NO.4 E-304
1
2
E-400
E-101
E-100
E-700
21
22
23
24
I
K
13
63
45
44
27
6
7
47
IG-SW
SSV
SSV
SSV
INJ#1
INJ#2
INJ#3
INJ#4
ECM E-601
E-601 B
A-101 B
E-301, E-302, E-303, E-304 B B B B
E-101 B
E-700 B
pzsmw030022t

Electronic Engine Controls (Page 6 of 11)

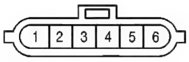

J
A-101
E-701
9
9
E-700
E-100
10
10
1
CAMSHAFT POSITION SENSOR
E-007
2
3
CANISTER CONTROL VALVE
E-022
3
IGNITION COIL
E-020
2
1
SPARK PLUG
SPARK PLUG
SPARK PLUG
SPARK PLUG
40
28
20
4
3
E-100
E-700
E-802
K
L
79
PHASE
46
EVAP
2
IGN2
5
IGN1
ECM E-601
E-601
B
A-101
B
E-022
B
E-007
B
E-020
B
E-700
B
pzsmw030023t

Electronic Engine Controls (Page 7 of 11)

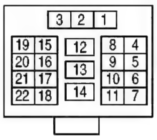

ECM E-601
GND
APS1
RSS1
GND
APS2
36
16
33
35
40
L
M
N
18
19
12
21
22
20
E-702
C-100
5
4
6
2
1
3
ACCELERATOR
PEDAL POSITION
SENSOR
C-301
SENSOR 1
SENSOR 2


1 2 3 4 5
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6

E-601
B



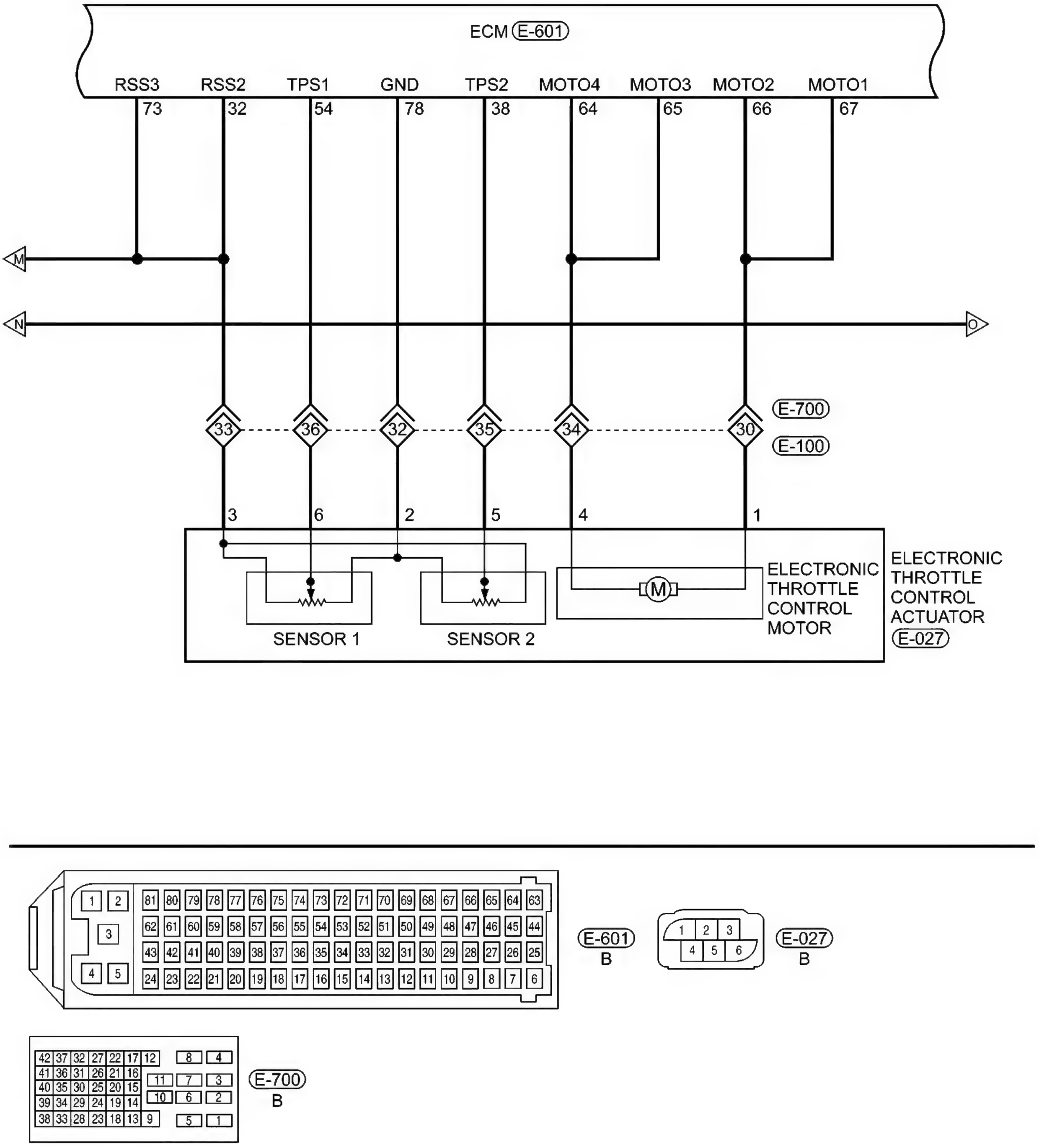
C-301
B


3 2 1
19 15 20 16 21 17 22 18
12 13 14
8 4 9 5 10 6 11 7

E-702
B

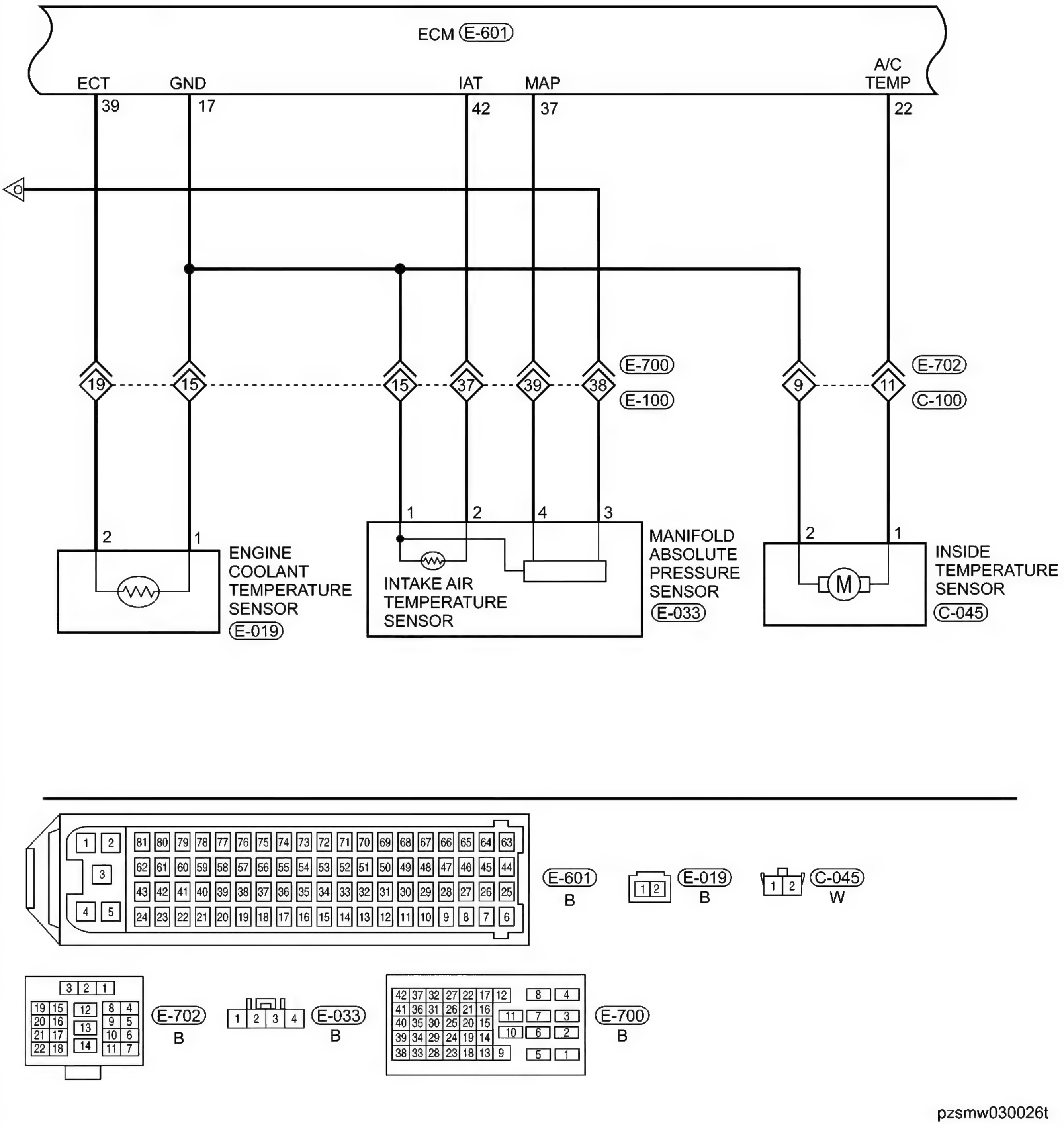
pzsmw030028t

Electronic Engine Controls (Page 8 of 11)

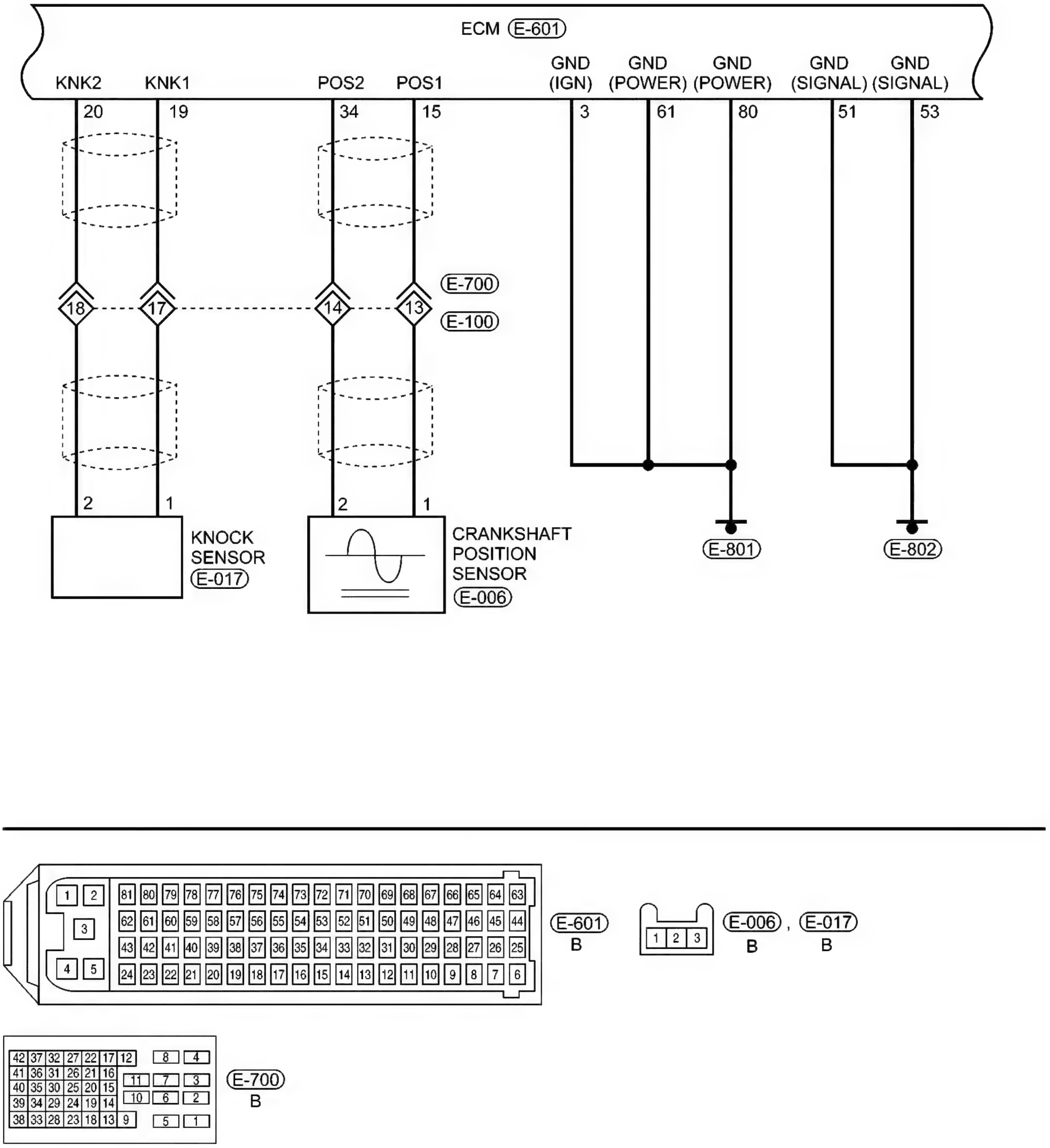

ECM E-601
RSS3 73
RSS2 32
TPS1 54
GND 78
TPS2 38
MOTO4 64
MOTO3 65
MOTO2 66
MOTO1 67
M
N
O
33
36
32
35
34
30
E-700
E-100
3
6
2
5
4
1
SENSOR 1
SENSOR 2
M
ELECTRONIC THROTTLE CONTROL MOTOR
ELECTRONIC THROTTLE CONTROL ACTUATOR
E-027
E-601
B
E-027
B
E-700
B

pzsmw030025t

Electronic Engine Controls (Page 9 of 11)

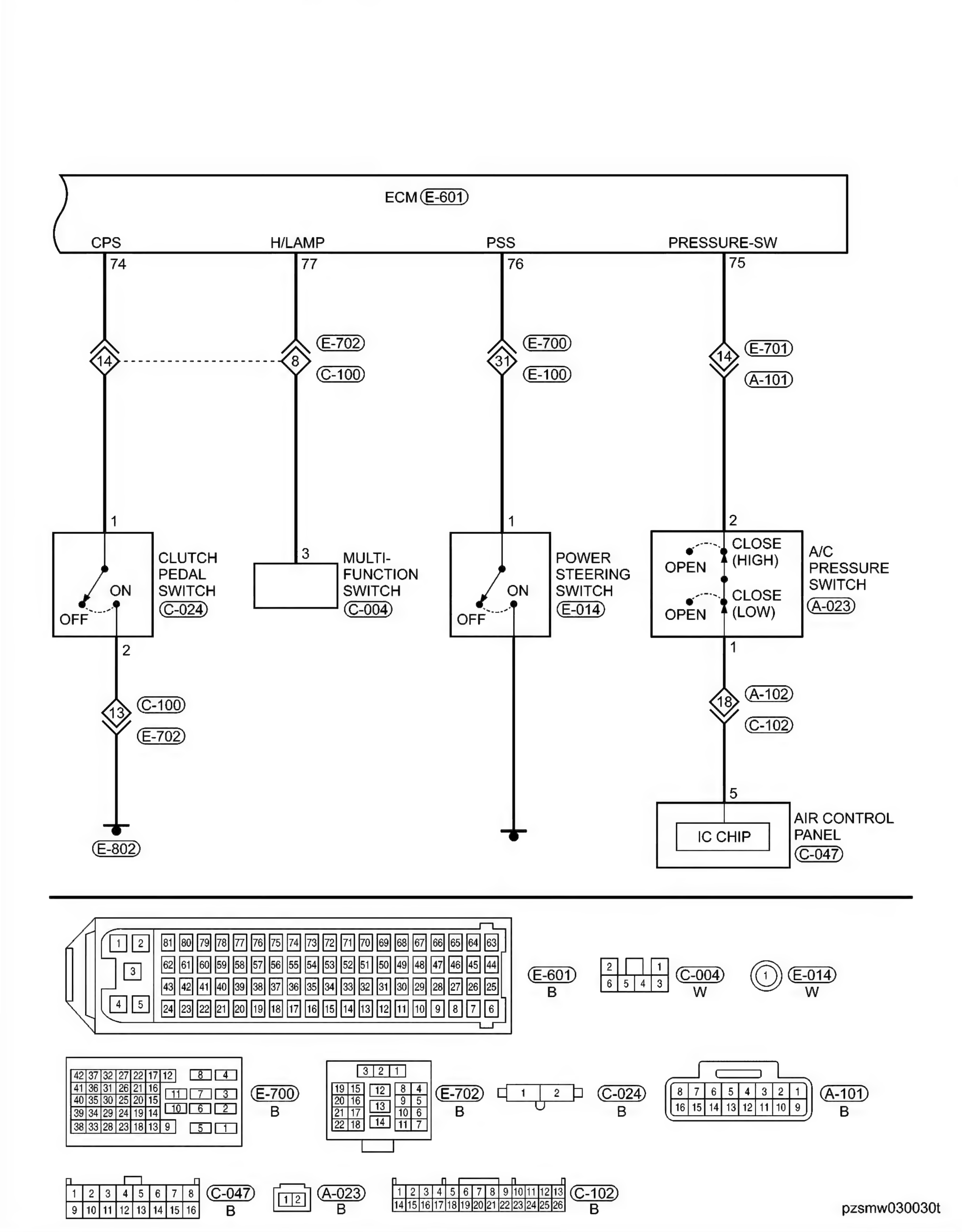

ECM E-601
ECT
39
GND
17
IAT
42
MAP
37
A/C TEMP
22
19
15
15
37
39
38
E-700
E-100
9
11
E-702
C-100
2
1
ENGINE COOLANT TEMPERATURE SENSOR
E-019
1
2
4
3
INTAKE AIR TEMPERATURE SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
E-033
2
1
M
INSIDE TEMPERATURE SENSOR
C-045
E-601
B
E-019
B
C-045
W
E-702
B
E-033
B
E-700
B
pzsmw030026t

Electronic Engine Controls (Page 10 of 11


ECM E-601
KNK2
KNK1
POS2
POS1
GND (IGN)
GND (POWER)
GND (POWER)
GND (SIGNAL)
GND (SIGNAL)
20
19
34
15
3
61
80
51
53
18
17
14
13
E-700
E-100
2
1
2
1
KNOCK SENSOR E-017
CRANKSHAFT POSITION SENSOR E-006
E-801
E-802
E-601 B
E-006, E-017 B
E-700 B

pzsmw030027t

Electronic Engine Controls (Page 11 of 11)


ECM
E-601
CPS
H/LAMP
PSS
PRESSURE-SW
74
77
76
75
14
8
31
14
E-702
C-100
E-700
E-100
E-701
A-101
1
3
1
2
OFF
ON
CLUTCH
PEDAL
SWITCH
C-024
MULTI-
FUNCTION
SWITCH
C-004
OFF
ON
POWER
STEERING
SWITCH
E-014
OPEN
CLOSE
(HIGH)
OPEN
CLOSE
(LOW)
A/C
PRESSURE
SWITCH
A-023
2
1
13
C-100
E-702
18
A-102
C-102
5
E-802
IC CHIP
AIR CONTROL
PANEL
C-047
E-601
B
C-004
W
E-014
W
E-700
B
E-702
B
C-024
B
A-101
B
C-047
B
A-023
B
C-102
B
pzsmw030030t

Engine Control Module (ECM) Connector Pin-Out Table

ECM PIN-OUT TABLE

PIN	CIRCUIT IDENTIFICATION	PIN	CIRCUIT IDENTIFICATION
1	-	42	Intake Air Temperature Sensor
2	Ignition Coil 2	43	-
3	GND (Ignition)	44	Switched Supply Voltage
4	-	45	Switched Supply Voltage
5	Ignition Coil 1	46	Canister Control Valve
6	Injector 2	47	Injector 4
7	Injector 3	48	Upstream Oxygen Sensor Heating
8	-	49	-
9	-	50	Fan Relay Control 1
10	-	51	GND (Signal)
11	EPC Lamp	52	-
12	Continuous Supply Voltage	53	GND (Signal)
13	Ignition Switch	54	Electronic Throttle Control Actuator
14	EMS Relay (Main Relay)	55	Downstream Oxygen Sensor
15	Crankshaft Position Sensor	56	-
16	Accelerator Position Sensor	57	-
17	Sensor (GND)	58	Brake Switch
18	Upstream Oxygen Sensor	59	Vehicle Speed Sensor
19	Knock Sensor 1	60	-
20	Knock Sensor 2	61	GND (Power)
21	Brake Switch	62	CAN-H
22	A/C Temperature Sensor	63	Switched Supply Voltage
23	-	64	Electronic Throttle Control Actuator
24	-	65	Electronic Throttle Control Actuator
25	-	66	Electronic Throttle Control Actuator
26	-	67	Electronic Throttle Control Actuator
27	Injector 1	68	Fan Relay Control 2
28	Downstream Oxygen Sensor Heating	69	Air Compressor Relay
29	-	70	Fuel Pump Relay
30	-	71	Diagnostic Link K
31	-	72	-
32	Regulated Sensor Supply 2	73	Regulated Sensor Supply 3
33	Regulated Sensor Supply 1	74	Clutch Pedal Switch
34	Crankshaft Position Sensor	75	A/C Pressure
35	Sensor (GND)	76	Power Steering Switch
36	Sensor (GND)	77	Headlamp Switch
37	Manifold Absolute Pressure Sensor	78	Sensor (GND)
38	Electronic Throttle Control Actuator	79	Camshaft Position Sensor
39	Engine Coolant Temperature Sensor	80	GND (Power)
40	Accelerator Pedal Position Sensor	81	CAN-L
41	-	-	-

DIAGNOSIS & TESTING

Diagnostic Help

1. The X-431 scan tool connects to the Data Link Connector (DLC) and communicates with the vehicle electronic modules through the K data network.
2. Confirm that the malfunction is current and carry-out the diagnostic tests and repair procedures.
3. If the Diagnostic Trouble Code (DTC) cannot be deleted, it is a current fault.
4. Use a digital multimeter to perform voltage readings on electronic systems.
5. Refer to any Technical Bulletins that may apply to the failure.
6. Visually inspect the related electrical wiring harness.
7. Inspect and clean all Engine Control Module (ECM) grounds that are related to the most current DTC.
8. If numerous trouble codes were set, use an electrical schematic and look for any common ground circuits or voltage supply circuits that may apply to the DTC.

Intermittent DTC Troubleshooting

If the failure is intermittent perform the following:

- Check for loose connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Monitor the scan tool data relative to this circuit.
- Wiggle the related electrical wiring harness and connectors while looking for an interrupted signal on the affected circuit.
- If possible, try to duplicate the conditions under which the DTC set.
- Look for the data to change or for the DTC to reset during the wiggle test.
- Look for broken, bent, pushed out or corroded terminals.
- Inspect the sensor and mounting area for any condition that would result in an incorrect signal, such as damage, or foreign material.
- A data recorder, and/or oscilloscope should be used to help diagnose intermittent conditions.
- Remove the Engine Control Module (ECM) from the troubled vehicle and install in a new vehicle and test. If the DTC cannot be deleted, the ECM is malfunctioning. If the DTC can be deleted, return the ECM to the original vehicle.

Ground Inspection

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This added resistance can alter the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can effect the circuit. Perform the following when inspecting a ground connection:

1. Remove the ground bolt or screw.
2. Inspect all mating surface for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for ″add-on″ accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are crimped to one eyelet, make sure no excess wire insulation has been crimped creating a bad ground.

Electronic Throttle Control Actuator Self-Learning Procedure Introduction

Electronic Pedal Control (EPC) Lamp Control Strategy

The EPC lamp will light when the ignition switch is turned to the ON position and the engine is not running. After the engine is started, the EPC lamp will go off if there is no EPC DTCs that exist in the ECM. If the internal EPC self-check failed, the EPC lamp will continue to light.

Electronic Throttle Control Actuator Self-Learning Procedure: Vehicle Setup Condition

- Engine stopped and the ignition switch on.
- Vehicle speed is 0 km/h.
- The Engine Coolant Temperature (ECT) is between 5.25°C and 100.5°C.
- The intake air temperature is more than 5.25°C.
- The accelerator pedal fully released.
- Battery voltage is more than 12 V.

Self-Learning Operating Procedure

Perform the following procedure to activate Self-Learning:
- Turn the ignition switch ON for 10 seconds.
- Turn the ignition switch OFF.

NOTE :
During the procedure, don’t operate any other components.

Self-Learning Components

Self-Learning should be performed if the following service procedures have been performed:
- After replacing the ECM.
- After disconnecting and reconnecting the ECM.
- After replacing the Accelerator Pedal or Electronic Throttle Control Actuator.

Self-Learning Condition

The self-learning condition is known as the ″Electronic Throttle Control Actuator Self-Learning Condition″.

CAUTION:
Ensure that the Electronic Throttle Control Actuator self-learning procedure lasts for at least 10 seconds according to the Electronic Throttle Control Actuator self-learning condition. If the self-learning procedure fails, the engine cannot be started, or the EPC lamp will be lit. If this condition occurs, the self-learning procedure should be performed again after the DTCs have been erased in ECM.

Diagnostic Trouble Code (DTC) List

DTC	DTC DEFINITION
P000A	″A″ Camshaft Position Slow Response
P000B	″B″ Camshaft Position Slow Response
P0010	″A″ Camshaft Position Actuator Circuit/Open
P0011	″A″ Camshaft Position - Timing Over - Advanced or System Performance
P0012	″A″ Camshaft Position - Timing Over - Retarded
P0013	″B″ Camshaft Position - Actual Circuit/Open
P0014	″B″ Camshaft Position - Timing Over - Advanced or System Performance
P0015	″B″ Camshaft Position - Timing Over - Retarded
P0016	Crankshaft - Camshaft Position Correlation
P0030	O_2 Sensor Heater Control Circuit (Bank 1 Sensor 1)
P0031	O_2 Sensor Heater Control Circuit (Bank 1 Sensor 1) Low
P0032	O_2 Sensor Heater Control Circuit (Bank 1 Sensor 1) High
P0036	O_2 Sensor Heater Control Circuit (Bank 1 Sensor 2)
P0037	O_2 Sensor Heater Control Circuit (Bank 1 Sensor 2) Low
P0038	O_2 Sensor Heater Control Circuit (Bank 1 Sensor 2) High
P0053	O_2 Sensor Heater Resistance (Bank 1 Sensor 1)
P0054	O_2 Sensor Heater Resistance (Bank 1 Sensor 2)

DTC	DTC DEFINITION
P0105	Manifold Absolute Pressure or Barometric Pressure Circuit
P0106	Manifold Absolute Pressure or Barometric Pressure Range/Performance
P0107	Manifold Absolute Pressure or Barometric Pressure Low Input
P0108	Manifold Absolute Pressure or Barometric Pressure High Input
P0112	Intake Air Temperature Circuit Low Input
P0113	Intake Air Temperature Circuit High Input
P0116	Engine Coolant Temperature Circuit Range/Performance
P0117	Engine Coolant Temperature Circuit Low Input
P0118	Engine Coolant Temperature Circuit High Input
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance
P0122	Throttle/Pedal Position Sensor A Circuit Low Input
P0123	Throttle/Pedal Position Sensor A Circuit High Input
P0130	O_2 Sensor Circuit Bank 1 - Sensor 1 Malfunction
P0131	O_2 Sensor Circuit Bank 1 - Sensor 1 Low Voltage
P0132	O_2 Sensor Circuit Bank 1 - Sensor 1 High Voltage
P0133	O_2 Sensor Circuit Bank 1 - Sensor 1 Slow Response
P0134	O_2 Sensor Circuit Bank 1 - Sensor 1 No Activity Detected
P0136	O_2 Sensor Circuit Bank 1 - Sensor 2 Malfunction
P0137	O_2 Sensor Circuit Bank 1 - Sensor 2 Low Voltage
P0138	O_2 Sensor Circuit Bank 1 - Sensor 2 High Voltage
P0140	O_2 Sensor Circuit Bank 1 - Sensor 2 No Activity Detected
P0170	Fuel Trim, Bank 1 Malfunction
P0171	Fuel Trim, Bank 1 System Too Lean
P0172	Fuel Trim, Bank 1 Too Rich
P0201	Cylinder 1 - Injector Circuit
P0202	Cylinder 2 - Injector Circuit
P0203	Cylinder 3 - Injector Circuit
P0204	Cylinder 4 - Injector Circuit
P0219	Engine Overspeed Condition
P0221	Throttle/Pedal Position Sensor/Switch B Range/Performance
P0222	Throttle/Pedal Position Sensor/Switch B Low Input
P0223	Throttle/Pedal Position Sensor/Switch B High Input
P0261	Cylinder 1 - Injector Circuit Low
P0262	Cylinder 1 - Injector Circuit High
P0264	Cylinder 2 - Injector Circuit Low
P0265	Cylinder 2 - Injector Circuit High
P0267	Cylinder 3 - Injector Circuit Low
P0268	Cylinder 3 - Injector Circuit High
P0270	Cylinder 4 - Injector Circuit Low
P0271	Cylinder 4 - Injector Circuit High
P0300	Random/Multiple Cylinder Misfire Detected
P0301	Cylinder 1 Misfire Detected
P0302	Cylinder 2 Misfire Detected

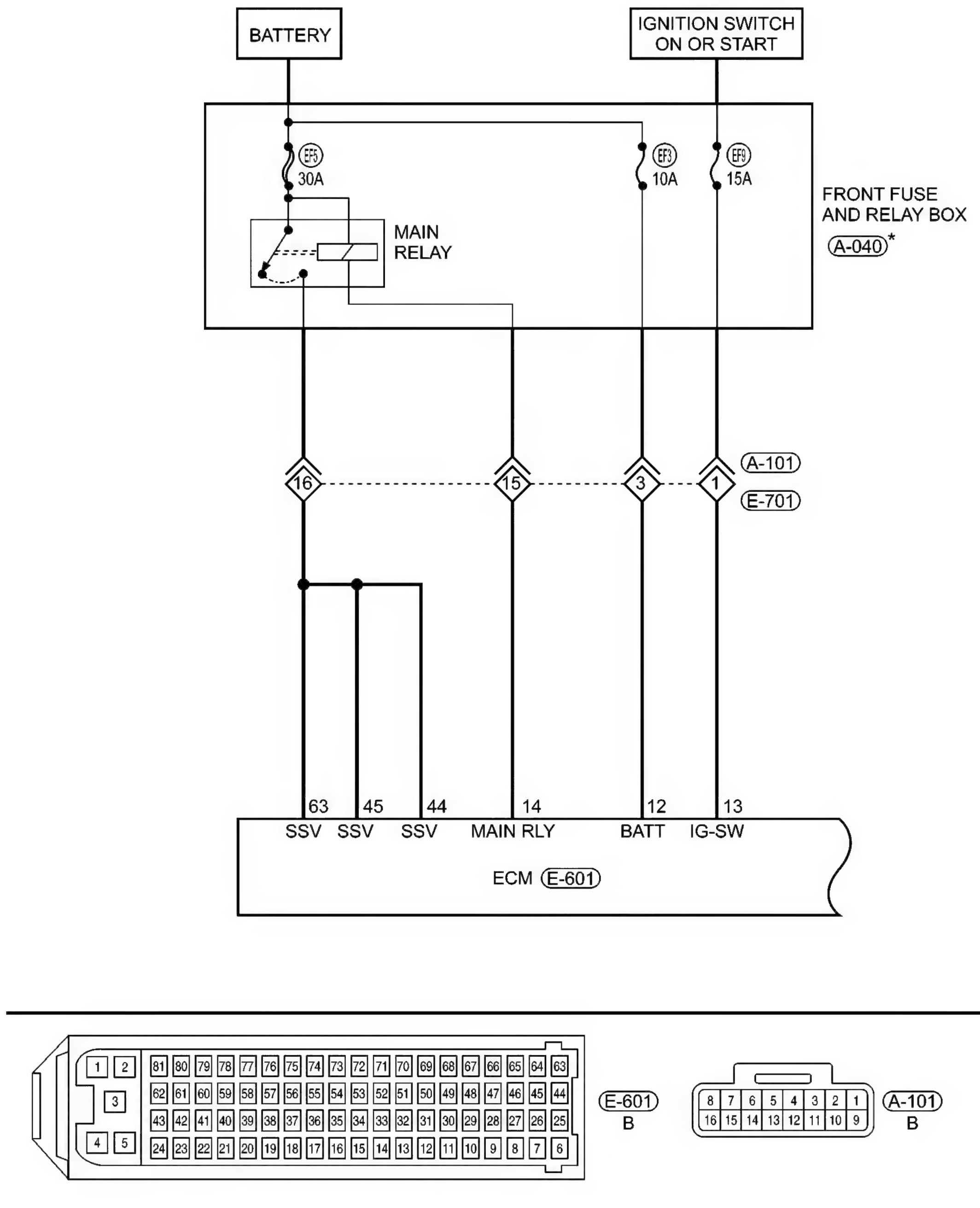
DTC	DTC DEFINITION
P0303	Cylinder 3 Misfire Detected
P0304	Cylinder 4 Misfire Detected
P0318	Rough Road Sensor ″A″ Signal Circuit
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal
P0324	Knock Control System Error
P0327	Knock Sensor 1 Circuit Low Input
P0328	Knock Sensor 1 Circuit High Input
P0340	Camshaft Position Sensor Circuit
P0341	Camshaft Position Sensor Circuit Range/Performance
P0342	Camshaft Position Sensor Circuit Low Input
P0343	Camshaft Position Sensor Circuit High Input
P0420	Catalyst System, Bank 1 Efficiency Below Threshold
P0444	Evaporative Emission System Purge Control Valve Circuit Open
P0458	Evaporative Emission System Purge Control Valve Circuit Low
P0459	Evaporative Emission System Purge Control Valve Circuit High
P0480	Cooling Fan 1 Control Circuit
P0481	Cooling Fan 2 Control Circuit
P0501	Vehicle Speed Sensor Range/Performance
P0506	Idle Control System RPM Lower than Expected
P0507	Idle Control System RPM Higher than Expected
P0508	Idle Air Control System Circuit Low
P0509	Idle Air Control System Circuit High
P0511	Idle Air Control Circuit
P0532	A/C Refrigerant Pressure Sensor Circuit Low Input
P0533	A/C Refrigerant Pressure Sensor Circuit High Input
P0537	A/C Evaporator Temperature Sensor Circuit Low
P0538	A/C Evaporator Temperature Sensor Circuit High
P0560	System Voltage Malfunction
P0562	System Voltage Low Voltage
P0563	System Voltage High Voltage
P0571	Brake Switch ″A″ Circuit
P0602	Control Module Programming Error
P0604	Internal Control Module Random Access Memory (RAM) Error
P0605	Internal Control Module ROM Test Error
P0606	ECM Processor
P0627	Fuel Pump ″A″ Control Circuit/Open
P0628	Fuel Pump ″A″ Control Circuit Low
P0629	Fuel Pump ″A″ Control Circuit High
P0645	A/C Clutch Relay Circuit
P0646	A/C Clutch Relay Control Circuit Low
P0647	A/C Clutch Relay Control Circuit High
P0650	Malfunction Indicator Lamp Control Circuit

DTC	DTC DEFINITION
P0688	EMC/ECM Power Relay Sense Circuit Open
P0691	Cooling Fan 1 Control Circuit Low
P0692	Cooling Fan 1 Control Circuit High
P0693	Cooling Fan 2 Control Circuit Low
P0694	Cooling Fan 2 Control Circuit High
P0700	Transmission Control System Malfunction
P0704	Clutch Switch Input Circuit
P1336	Engine Torque Control Adaptation at Limit
P1545	Throttle Position Control Malfunction
P1558	Throttle Actuator Electrical Malfunction
P1559	Idle Speed Control Throttle Position Adaptation Malfunction
P1564	Idle Speed Control Throttle Position Low Voltage during Adaptation
P1565	Idle Speed Control Throttle Position Lower Limit not Attained
P1568	Idle Speed Control Throttle Position Mechanical Malfunction
P1579	Idle Speed Control Throttle Position Adaptation not Started
P1604	Internal Control Module Driver Error
P1610	Manufacture Controlled Computer and Auxiliary Outputs
P1611	Manufacture Controlled Computer and Auxiliary Outputs
P1612	Manufacture Controlled Computer and Auxiliary Outputs
P1613	Manufacture Controlled Computer and Auxiliary Outputs
P1614	Manufacture Controlled Computer and Auxiliary Outputs
P1651	Manufacture Controlled Computer and Auxiliary Outputs
P2106	Throttle Actuator Control System Forced Limited Power
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input
P2128	Throttle/Pedal Position Sensor/Switch E Circuit High Input
P2138	Accelerator Pedal Position Sensor Signal Correlation Error
P2177	System Too Lean off Idle
P2178	System Too Rich off Idle
P2187	System Too Lean at Idle
P2188	System Too Rich at Idle
P2195	O_2 Sensor Signal Stuck Lean; Bank 1 Sensor 1
P2196	O_2 Sensor Signal Stuck Rich; Bank 1 Sensor 1
P2270	O_2 Sensor Signal Stuck Lean; Bank 1 Sensor 2
P2271	O_2 Sensor Signal Stuck Rich; Bank 1 Sensor 2
U0001	High Speed CAN Defective
U0101	Lost Communication with ECM
U104	Lost Communication with Cruise Control Module
U0121	Lost Communication with Anti-Lock Brake System (ABS) Control Module
U0155	Lost Communication with Instrument Panel Cluster Control Module
U0415	Invalid Data Received from ABS Control Module

Power Supply and Ground Circuit Test

Power Supply and Ground Circuit

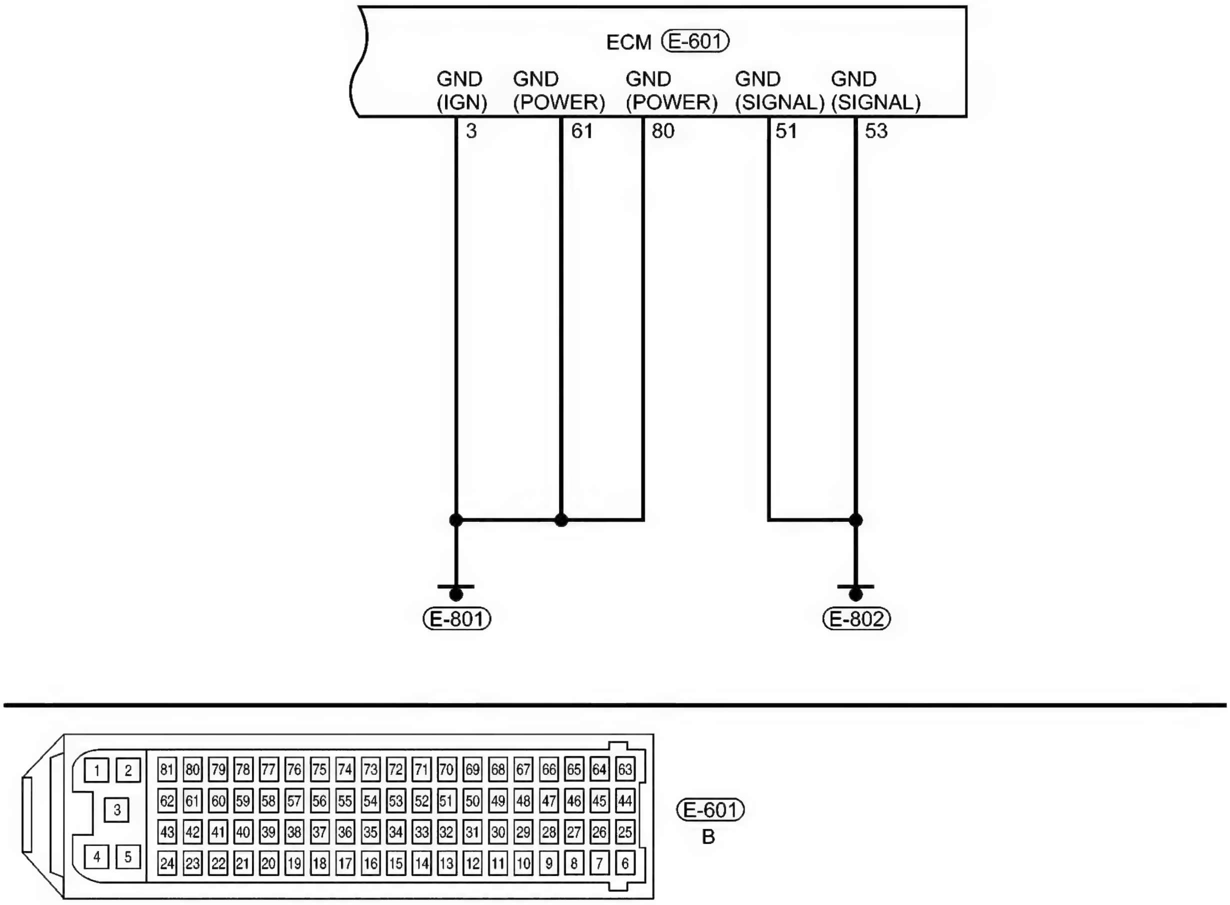
* : HARD WIRED TO VEHICLE HARNESS


BATTERY
IGNITION SWITCH ON OR START
EF5 30A
EF3 10A
EF9 15A
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
16
15
3
1
A-101
E-701
63 SSV
45 SSV
44 SSV
14 MAIN RLY
12 BATT
13 IG-SW
ECM E-601
E-601 B
A-101 B

pzsmw030001t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
12	Continuous Supply Voltage	-	Voltage (11 - 14 V)
13	Ignition Switch	Ignition switch: ON	Voltage (11 - 14 V)
		Ignition switch: OFF	Approximately 0 V
14	EMS Relay (Main Relay)	Ignition switch: OFF More than a few seconds after turning ignition switch OFF	Voltage (11 - 14 V)
44	Switched Supply Voltage	Ignition switch: ON	Voltage (11 - 14 V)
45			
63			


ECM E-601
GND (IGN)
GND (POWER)
GND (POWER)
GND (SIGNAL)
GND (SIGNAL)
3
61
80
51
53
E-801
E-802
1 2
3
4 5
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B

pzsmw030002t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
3	GND (Ignition)	Ignition switch: ON	Approximately 0 V
51	GND (Signal)	Ignition switch: ON	Approximately 0 V
53	GND (Signal)	Ignition switch: ON	Approximately 0 V
61	GND (Power)	Ignition switch: ON	Approximately 0 V
80	GND (Power)	Ignition switch: ON	Approximately 0 V

Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view data stream.
- If the data stream is not detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the data stream is detected, the condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. PRELIMINARY INSPECTION

- Attempt to start the engine.

Is engine running?

Yes >> Go to step 8.

No >> Go to step 2.

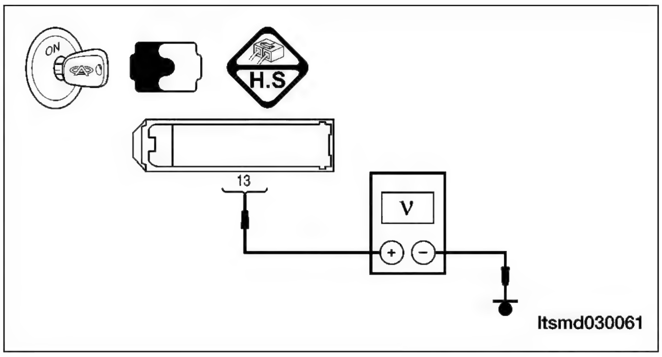
2. CHECK ECM POWER SUPPLY CIRCUIT - (1)

- Access the ECM electrical connector (do not disconnect the connector).
- Turn ignition switch off and then on.
- Check the voltage between ECM terminal 13 and ground, harness side.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to step 4.

No >> Go to step 3.



3. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
    - Fuse EF9 (15A)
    - Harness between ECM and fuse
    - Front fuse and relay box A-040
    - Terminal 1 in connector A-101 & E-701

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace any malfunctioning part(s).

4. CHECK ECM POWER SUPPLY CIRCUIT - (2)

- Check the voltage between ECM terminal 12 and ground harness side.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Check and repair the following as necessary:

- Fuse EF3 (10A)
- Terminal 3 in connector A-101 & E-701
- Front fuse and relay box connector A-040
- Harness open or short between ECM connector E-601 terminal 12 and battery

5. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground connections.

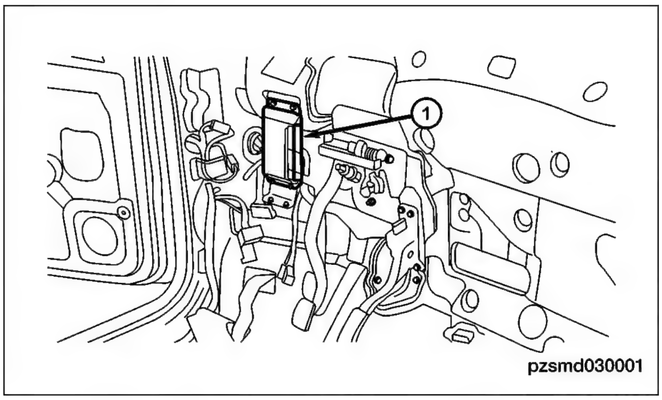
6. CHECK ECM GROUND CIRCUIT FOR AN OPEN OR SHORT

- Disconnect the ECM electrical connector (1).
- Check continuity between ECM terminals 3, 51, 53, 61, 80 and ground terminal side.
- Continuity should exist.
- Check harness for a short to power.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.



7. DETECT MALFUNCTIONING PART

- Check the harness for an open or short between ECM terminals 3, 51, 53, 61, 80 and ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair the circuit for an open or short to power in harness or connectors.

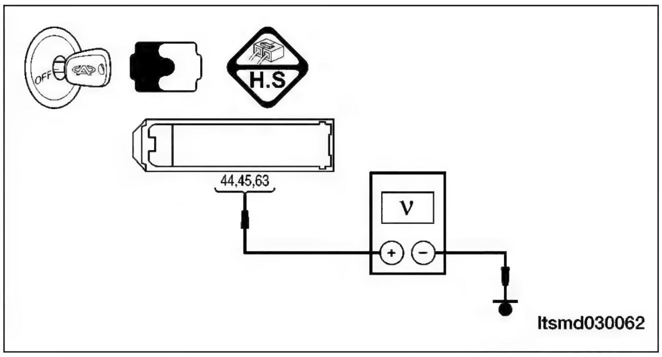
8. CHECK ECM POWER SUPPLY CIRCUIT - (3)

- Connect the ECM electrical connector.
- Turn ignition switch on and then off.
- Check the voltage between ECM terminals 44, 45, 63 and ground harness side.
  - Turn the ignition switch on, battery voltage should exist.
  - Turn the ignition switch off, battery voltage will exist for a few seconds, then drop to approximately 0 V.

Is the check result normal?

Yes >> Check the starting system.

No >> Go to the next step.



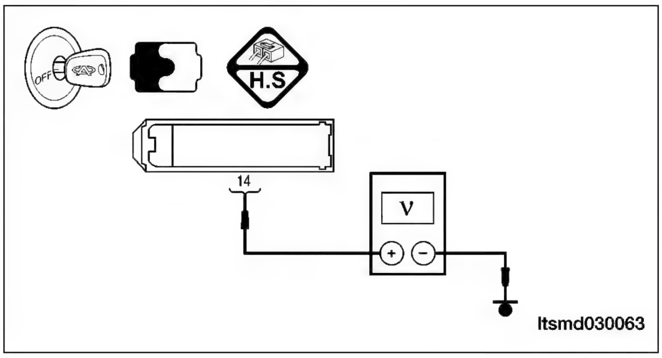
9. CHECK MAIN RELAY SUPPLY VOLTAGE

- Turn ignition switch off.
- Wait for at least 10 seconds.
- Check the voltage between ECM terminal 14 and ground, harness side.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Go to step 11.



10. CHECK ECM POWER SUPPLYCIRCUIT - (4)

- Disconnect the negative battery cable.
- Disconnect the ECM electrical connector.
- Remove the main relay.
- Check the continuity between ECM terminals 44, 45, 63 and main relay terminal in the front fuse and relay box A-040.
- Check the main relay.
- Check terminal 16 in connectors A-101 & E-701.
- Check harness for a short to ground or short to power.

Is the check result normal?

Yes >> Go to step 12.

No >> Repair the circuit for an open, short in harness or connectors or front fuse and relay box A-040.

11. CHECK MAIN RELAY CIRCUIT

- Disconnect the ECM electrical connector.
- Remove the main relay.
- Check the continuity between ECM terminal 14 and main relay terminal in the front fuse and relay box A-040.
- Continuity should exist.
- Check the main relay.
- Check terminal 15 in connectors A-101 & E-701.
- Check harness for a short to ground or short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the malfunctioning components.

12. CHECK FUSE

- Disconnect fuse EF5 (30A), fuse EF3 (10A) in the front fuse and relay box A-040.
- Check the fuses for an open.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the damaged components.

13. TEST-3 CHECK FRONT FUSE AND RELAY BOX

- Check front fuse and relay box for damage.

Is the check result normal?

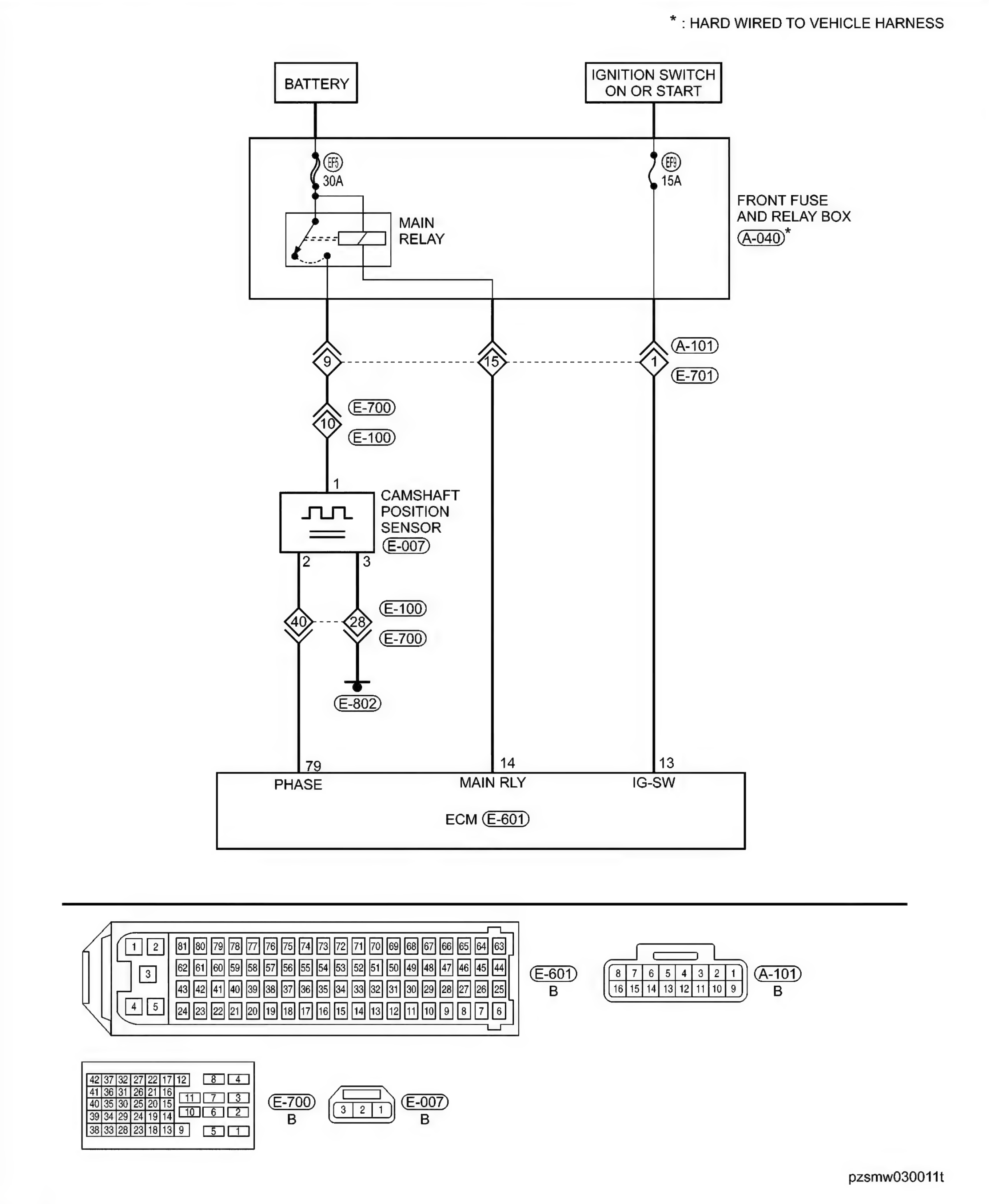
Yes >> Replace the ECM.

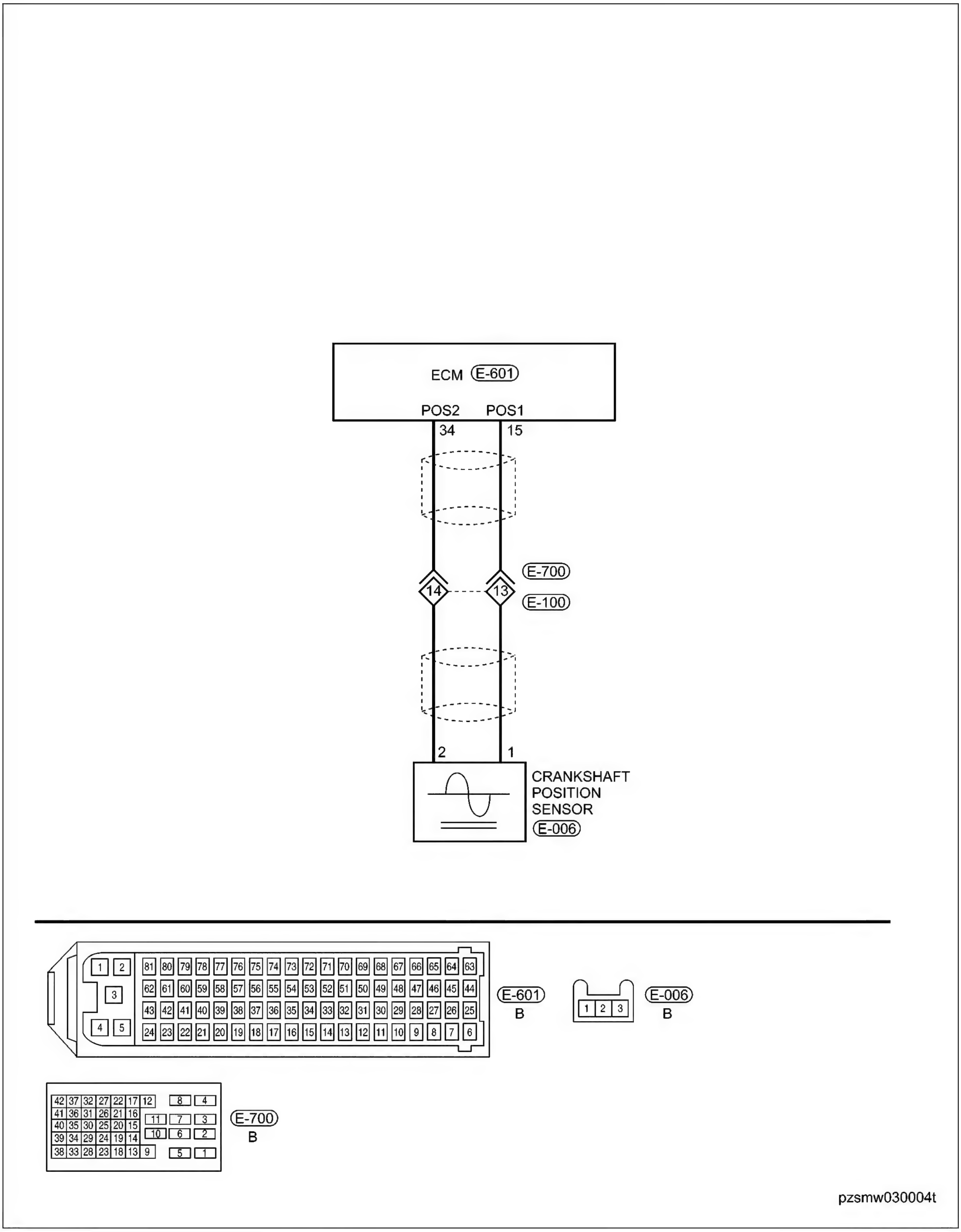
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Replace the front fuse and relay box.

Diagnostic Trouble Code (DTC) Tests

P0016 - Camshaft Position-Crankshaft Position Correlation Error


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5
30A
EF9
15A
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
A-101
E-701
9
15
1
E-700
10
E-100
1
CAMSHAFT POSITION SENSOR
E-007
2
3
E-100
40
28
E-700
E-802
79
14
13
PHASE
MAIN RLY
IG-SW
ECM E-601
1 2 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
3 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
A-101
B
42 37 32 27 22 17 12
41 36 31 26 21 16
40 35 30 25 20 15
39 34 29 24 19 14
38 33 28 23 18 13 9
8 4
11 7 3
10 6 2
5 1
E-700
B
3 2 1
E-007
B
pzsmw030011t


ECM
E-601
POS2
POS1
34
15
E-700
14
13
E-100
2
1
CRANKSHAFT
POSITION
SENSOR
E-006
E-601
B
E-006
B
E-700
B
pzsmw030004t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
15	Crankshaft Position (CKP) sensor	• Ignition switch: ON • Engine: Not cranking	Approximately 3 V
34			
79	Camshaft Position (CMP) sensor	• Ignition switch: ON • Engine: Not cranking	Approximately 10 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0016	Camshaft position-Crankshaft position correlation error	Engine is running	ECM detected that the CMP sensor is out of phase with CKP sensor.	• CMP sensor • CKP sensor • Harness or connectors • Camshaft signal plate • Crankshaft signal plate • Timing misalignment • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

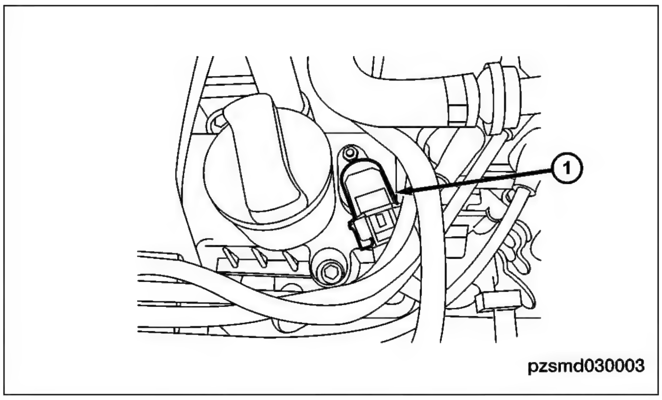
2. CHECK CMP SENSOR ELECTRICAL CONNECTOR

- Disconnect the CMP sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



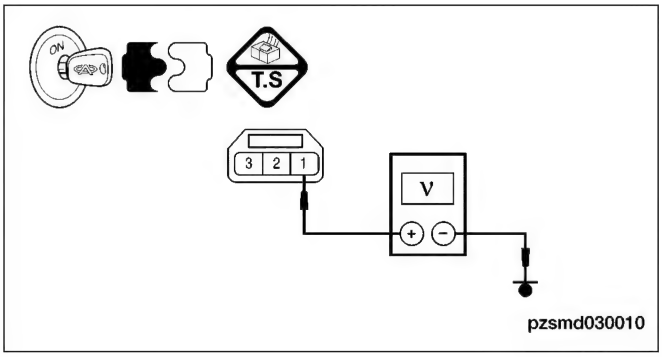
3. CHECK THE CMP SENSOR POWER SUPPLY CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch on.
- Check the voltage between terminal 1 and ground in CMP sensor connector E-007 terminal side.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



4. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Fuse EF5
  - Main relay
  - Front fuse and relay box K A-040
  - Harness for an open or short between CMP sensor terminal 1 and fuse EF5
  - Harness for an open or short between ECM terminal 14 and fuse EF5
- Repair or replace any malfunctioning part(s) as necessary.
- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC P0016 still present?

Yes >> Go to the next step.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

5. CHECK THE CMP SENSOR GROUND CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Check continuity between CMP sensor terminal 3 and ground.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or short in harness or connector.

6. CHECK THE CMP SENSOR INPUT SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch on.
- Check the voltage between terminal 2 and ground in CMP sensor connector E-007 terminal side.
- 11 V should exist.

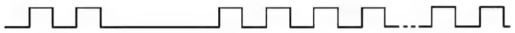
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open, short to power or short to ground in harness or connectors. If circuit is normal, go to the next step.

7. CHECK CMP SENSOR SIGNAL

- Turn ignition switch off.
- Connect CMP sensor electrical connector.
- Check the CMP output signal between terminal 2 and ground in CMP sensor connector E-007 terminal side, with the engine running.
- Approximately 6 V square wave signal should exist.

CMP SENSOR SIGNAL OUTPUT	
	CMP SENSOR SIGNAL
WITH ENGINE ANALYZER (KES-200)	 vismd030003

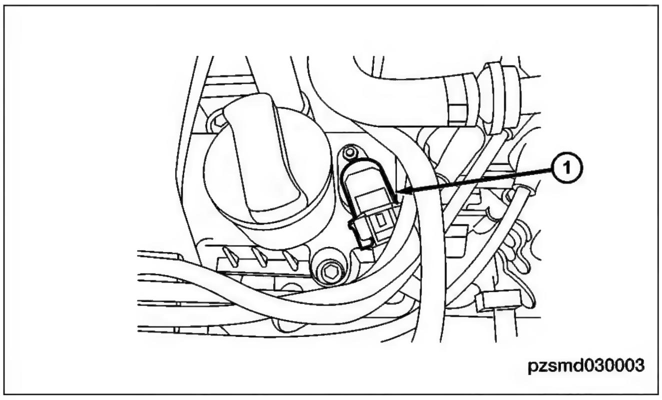
Is the CMP output signal normal?

Yes >> Go to step 10.

No >> Go to the next step.

8. CHECK CMP SENSOR

- Remove the CMP sensor (1).
- Inspect and clean the CMP sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.



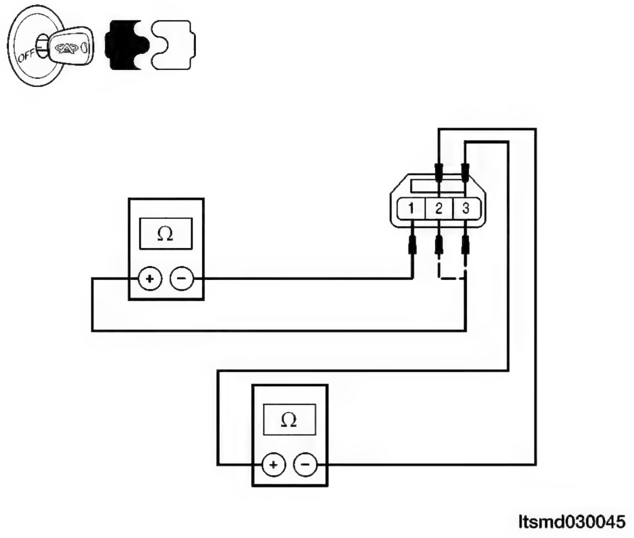
Is the sensor mounting area OK?

Yes >> Go to the next step.

No >> Repair or replace the sensor as necessary.

9. CHECK CMP SENSOR RESISTANCE

- Check resistance between the following CMP sensor terminals, component side:

CMP SENSOR RESISTANCE		
TERMINAL NO.	**RESISTANCE Ω (25°C)**	
1 & 2	Except 0 or ∞	
1 & 3		
2 & 3		

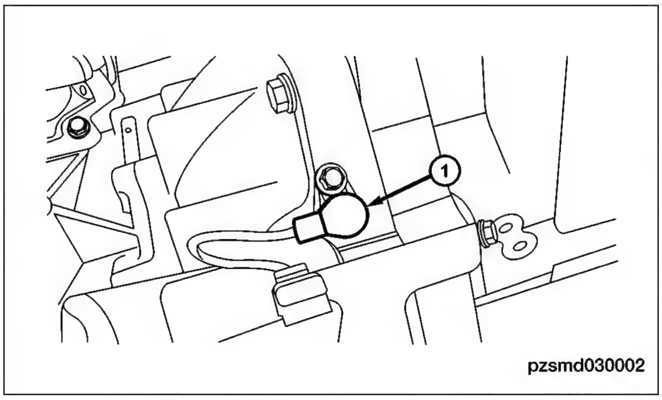
Is the check result normal?

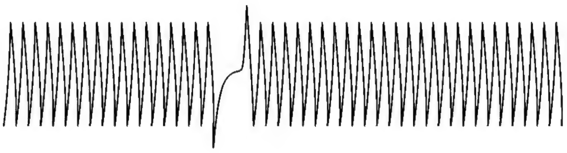
Yes >> Replace the CMP sensor with a known good CMP sensor.
Monitor the CMP sensor signal on the KES-200 screen.
– If the CMP sensor signals were normal, the system is OK.
– If the CMP sensor signals were still irregular or missing, go to step 13.

No >> Replace CMP sensor.

10. CHECK CKP SENSOR SIGNAL WAVE PATTERN

- Check signal between terminal 1 and ground, terminal 2 and ground in CKP sensor (1) connector E-006 terminal side, with the engine running.



CKP SENSOR SIGNAL OUTPUT	
	CKP SENSOR SIGNAL
WITH ENGINE ANALYZER (KES-200)	

Is the CKP output signal normal?

Yes >> Go to step 16.

No >> Go to the next step.

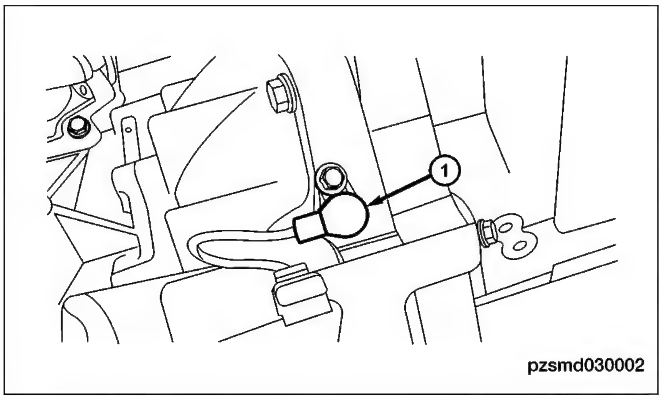
11. CHECK CKP SENSOR

- Remove the CKP sensor (1).
- Inspect and clean the CKP sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material, or excessive movement.

Is the sensor mounting area OK?

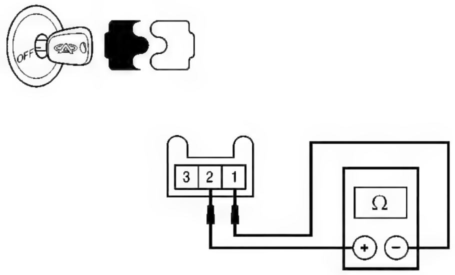
Yes >> Go to the next step.

No >> Repair or replace the sensor as necessary.



12. CHECK CKP SENSOR RESISTANCE

- Check resistance between the following CKP sensor terminals, component side:

CKP SENSOR RESISTANCE		
TERMINAL NO.	**RESISTANCE Ω (25°C)**	 Itsmd030049
1 & 2	Approximately 1000 Ω	

Is the check result normal?

Yes >> Replace the CKP sensor with a known good CKP sensor.
Monitor the CKP sensor signal on the KES-200 screen.
– If the CKP sensor signals were normal, the system is OK.
– If the CKP sensor signals were still irregular or missing, go to step 14.

No >> Replace CKP sensor.

13. CHECK THE CAMSHAFT AND CAMSHAFT SIGNAL PLATE

- Remove the cylinder head cover and timing belt cover (See Timing Belt Removal & Installation in Section 02 Engine).
- Check the installed clearance (See CMP Sensor Removal & Installation in Section 03 Electronic Engine Controls).

NOTE :
0.8 - 1.2 mm gap should exist.

- Check the camshaft and camshaft signal plate for any condition that would result in an incorrect signal, such as damage, loose mounting or foreign material when rotating the camshaft.

Were any problems found?

Yes >> Remove any debris and clean the camshaft signal plate or replace the camshaft.
Reinstall the CMP sensor.

No >> Go to step 16.

14. CHECK THE CRANKSHAFT AND CRANKSHAFT SIGNAL PLATE

- Check the installed clearance (See Crankshaft Position Sensor Removal & Installation in Section 03 Electronic Engine Controls).

NOTE :
0.8 - 1.2 mm gap should exist.

- Check the crankshaft and crankshaft signal plate for any condition that would result in an incorrect signal, such as damage, loose mounting or foreign material when rotating the crankshaft.

Were any problems found?

Yes >> Remove any debris and clean the crankshaft signal plate or replace the crankshaft.
Reinstall the CKP sensor.

No >> Go to the next step.

15. CHECK THE ENGINE BASE TIMING

- Check for timing belt misalignment.

Is the timing belt misaligned?

Yes >> Align the engine timing belt (See Timing Belt Removal & Installation in Section 02 Engine).

No >> Go to the next step.

16. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

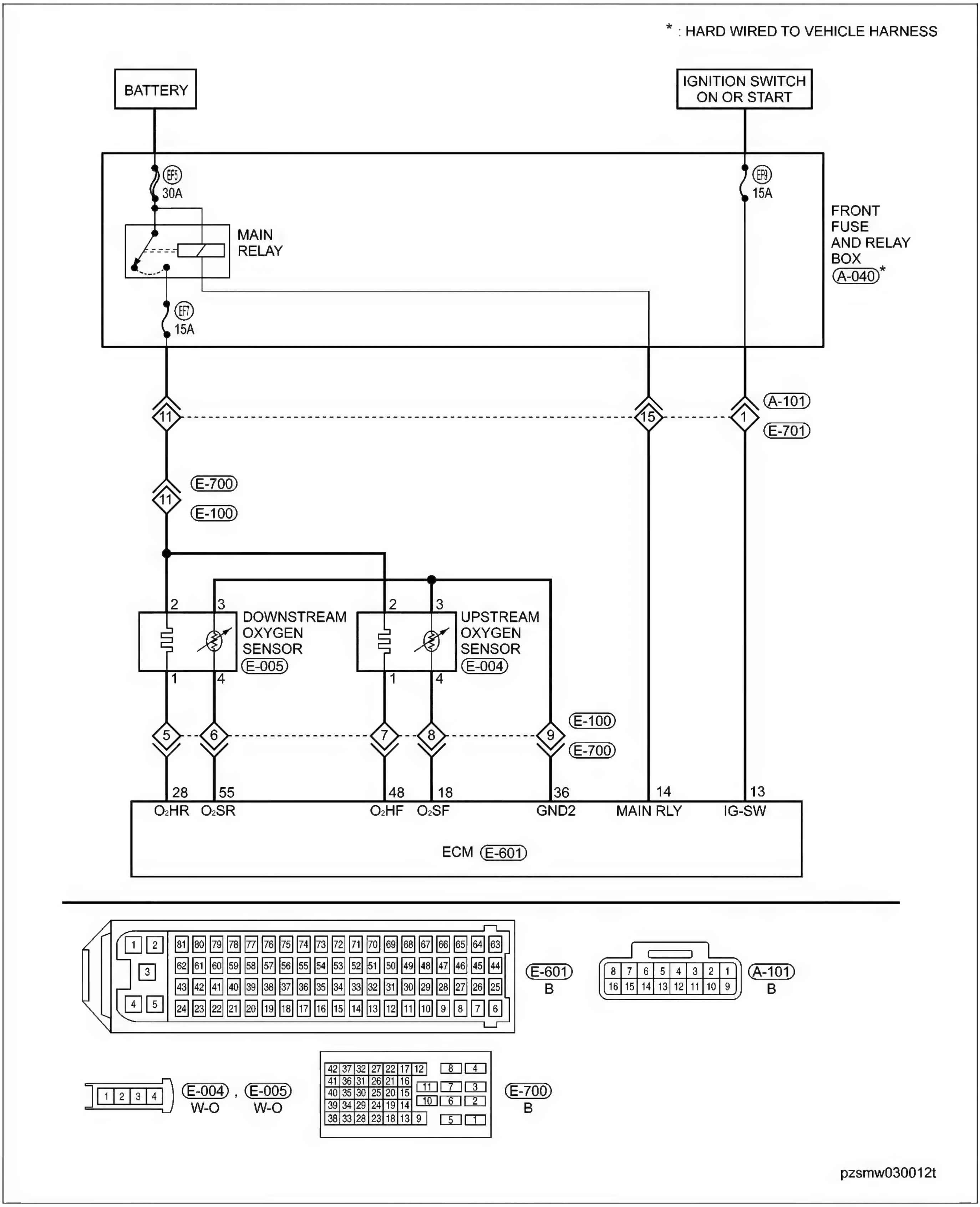
Is DTC P0016 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0031 - O_2 Sensor 1 Heater Control Circuit Low
P0032 - O_2 Sensor 1 Heater Control Circuit High


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5 30A
EF9 15A
MAIN RELAY
EF7 15A
FRONT FUSE AND RELAY BOX A-040*
A-101
E-701
E-700
E-100
11
15
1
2
3
DOWNSTREAM OXYGEN SENSOR E-005
UPSTREAM OXYGEN SENSOR E-004
1
4
5
6
7
8
9
28 O2HR
55 O2SR
48 O2HF
18 O2SF
36 GND2
14 MAIN RLY
13 IG-SW
ECM E-601
E-601 B
A-101 B
E-004, E-005 W-O W-O
E-700 B
pzsmw030012t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
18	Upstream O_2 sensor	Engine is running Warm-up condition Keep the engine speed 2000 RPM	Approximately 0.1 V - 0.9 V (change 5 - 8 times in 10 seconds periodically)
28	Downstream O_2 sensor heating	-	-
36	Sensor (GND)	Warm-up condition Idle speed	Approximately 0 V
48	Upstream O_2 sensor heating	-	-
55	Downstream O_2 sensor	Engine is running Warm-up condition Keep the engine speed 2000 RPM	Approximately 100 mV

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0031	O_2 sensor 1 heater control circuit low	Engine is running	• Oxygen sensor • Harness or connectors • ECM
P0032	O_2 sensor 1 heater control circuit high		• Oxygen sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- Turn ignition switch off and wait at least 10 seconds.
- Start the engine and keep the engine speed 2000 RPM for at least 1 minute.
- Let engine idle for 2 minutes.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

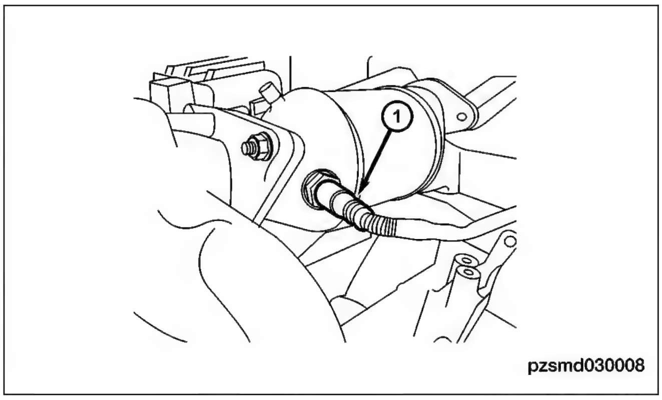
2. CHECK O_2 SENSOR ELECTRICAL CONNECTOR

- Disconnect the O_2 sensor (1) electrical connector E-004.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



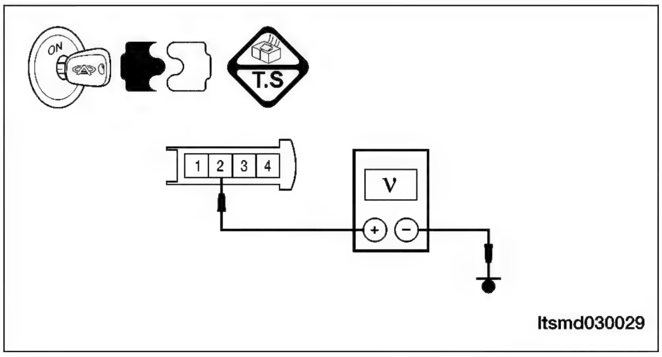
3. CHECK O_2 SENSOR HEATER POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check the voltage between terminal 2 and ground in the O_2 sensor connector E-004 terminal side.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to Step 5.

No >> Go to the next step.



4. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Fuse EF5, fuse EF7
  - Main relay
  - Front fuse and relay box A-040
  - Harness for an open or short between O_2 sensor and fuse
- Repair or replace any malfunctioning part(s).
- With X-431, select view DTC.

Is DTC P0031 or P0032 still present?

Yes >> Go to the next step.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

5. CHECK THE O_2 SENSOR HEATER CONTROL CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect the ECM connector.
- Check continuity between ECM terminal and O_2 sensor terminal.

O_2 SENSOR HEATER CONTROL CIRCUIT	
COMPONENT	**TERMINAL**
ECM	48
Upstream Oxygen Sensor	1

- Continuity should exist.
- Check harness for a short to ground or short to power.

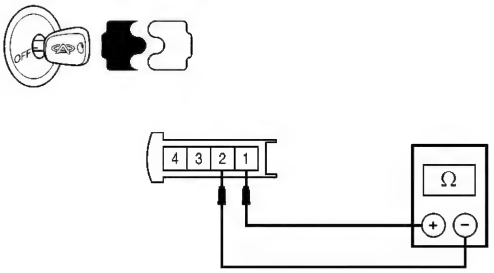
Is the check result normal?

Yes >> Go to the next step.

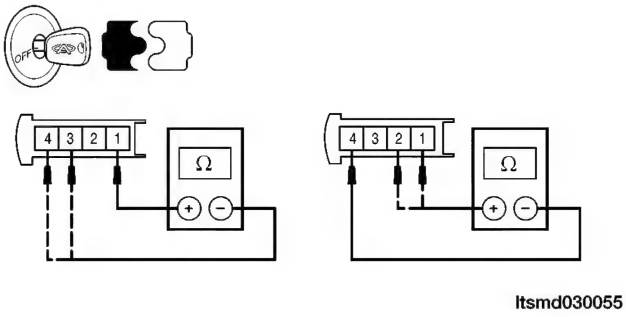
No >> Repair or replace the circuit for an open, short to ground or short to power in harness or connectors.

6. CHECK THE O_2 SENSOR HEATER

- Check resistance between the following O_2 sensor terminals, component side:

O_2 SENSOR HEATER RESISTANCE		
TERMINAL NO.	**RESISTANCE**	 ltsmd030030
1 & 2 (including wire and connector)	Approximately 2.5 - 4.9 Ω	

- Check resistance between the following O_2 sensor terminals, component side:

CHECK O_2 SENSOR RESISTANCE		
TERMINAL NO.	**RESISTANCE**	 OFF 4 3 2 1 Ω + − 4 3 2 1 Ω + − ltsmd030055
1 & 3 and 1 & 4	∞ Ω (Continuity should not exist)	
4 & 1 and 4 & 2		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the O_2 sensor.

7. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

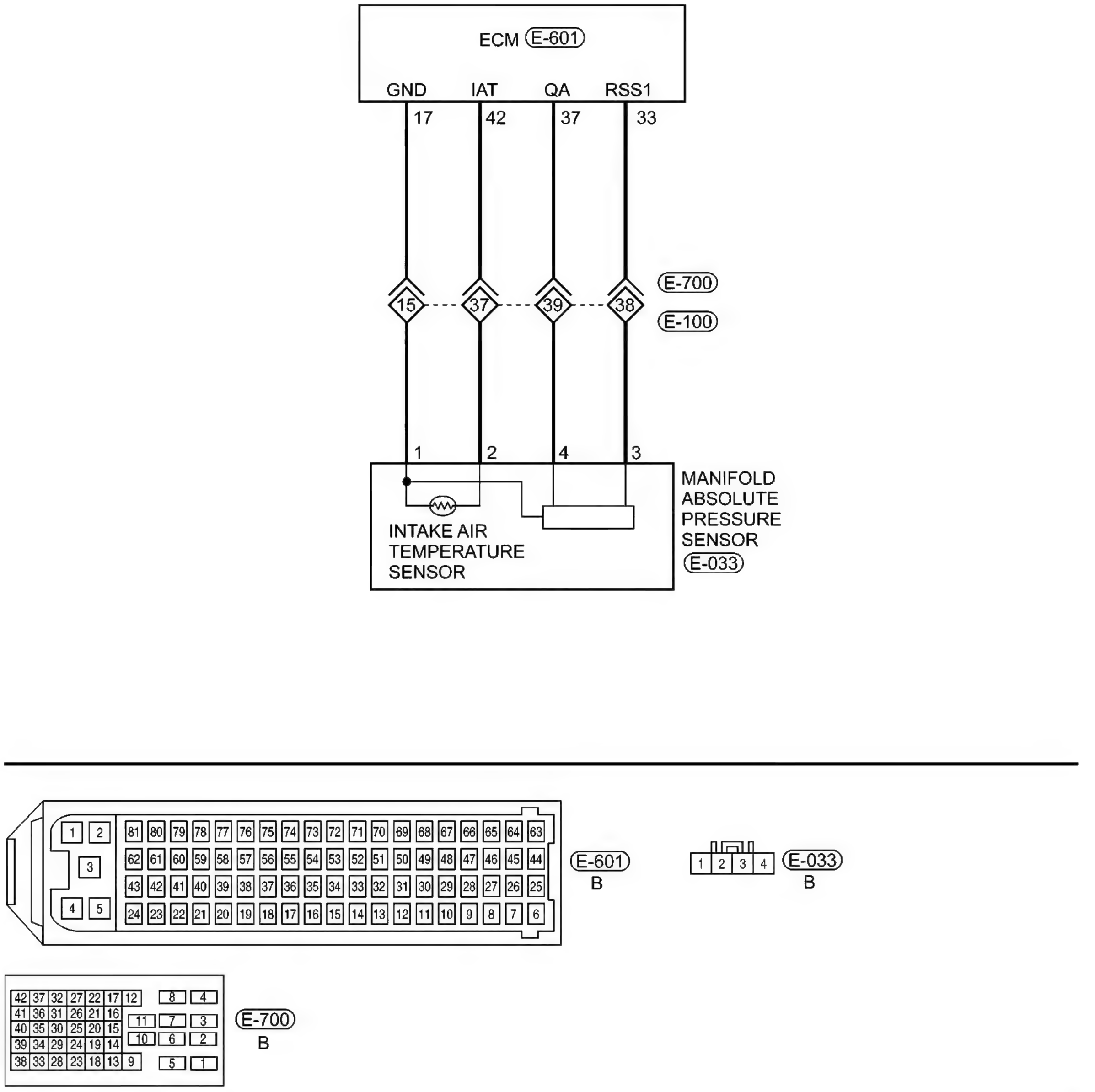
Is DTC P0031 or P0032 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0105 - Manifold Absolute Pressure/Barometric Pressure Circuit
P0106 - Manifold Absolute Pressure Or Barometric Pressure Range/Performance


ECM E-601
GND
IAT
QA
RSS1
17
42
37
33
15
37
39
38
E-700
E-100
1
2
4
3
INTAKE AIR TEMPERATURE SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
E-033
E-601
B
E-033
B
E-700
B

pzsmw030007t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
17	Sensor (GND)	Engine: Running	-	Approximately 0 V
33	Regulated sensor supply 1		-	Approximately 5 V
37	Manifold Absolute Pressure (MAP) sensor		Engine running: Idle Press accelerator pedal slowly	Approximately 1.3 V
			Press accelerator pedal quickly	Up to approximately 4 V (instantaneous)

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0105	Manifold absolute pressure/barometric pressure circuit	Ignition switch ON or after engine is started	Signal output is out of acceptable range for a few seconds continuously.	• MAP sensor • Harness or connectors • ECM
P0106	Manifold absolute pressure or barometric pressure range/performance			• MAP sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground connections.

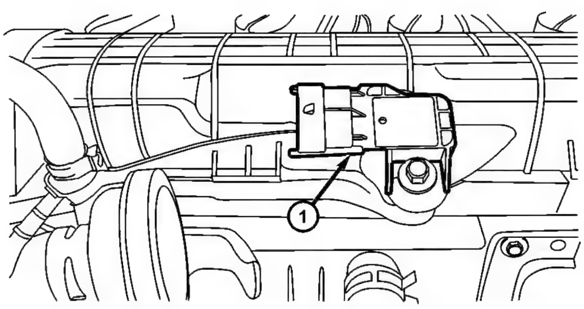
2. CHECK MAP SENSOR ELECTRICAL CONNECTOR

- Disconnect the MAP sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



pzsmd030007

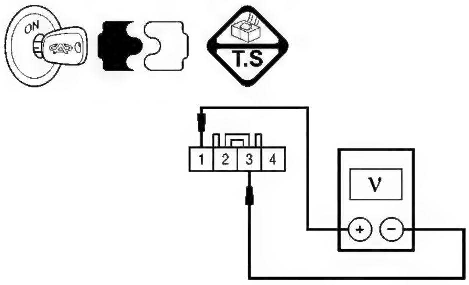
3. CHECK THE MAP SENSOR POWER SUPPLY

- Turn ignition switch on.
- Check the voltage between terminal 1 and 3 in the MAP sensor connector E-033 terminal side.
- 5 V should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



vismd030010

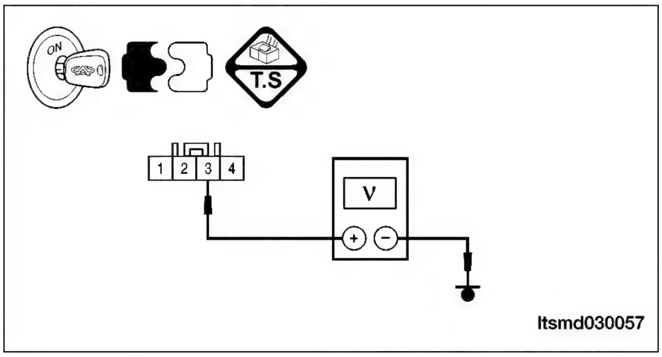
4. CHECK THE MAP SENSOR POWER SUPPLY CIRCUIT FOR AN OPEN OR SHORT

- Check the voltage between terminal 3 and ground in the MAP sensor connector E-033 terminal side.
- Approximately 5 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to ground or short to power in harness or connectors.
If circuit is normal, go to the next step.



5. CHECK THE MAP SENSOR GROUND CIRCUIT FOR AN OPEN

- Turn ignition switch off.
- Disconnect the MAP sensor electrical connector E-001.
- Check the continuity between terminal 1 in MAP sensor connector E-033 and terminal 17 in ECM connector E-601.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open in harness or connectors.

6. CHECK THE MAP SENSOR OUTPUT SIGNAL CIRCUIT FOR AN OPEN OR HIGH RESISTANCE

- Check the continuity between MAP sensor terminal 4 and ECM terminal 37.
- Continuity should exist.

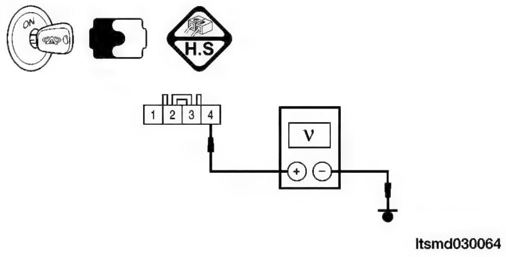
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or high resistance in harness or connectors.

7. CHECK THE MAP SENSOR SIGNAL

- Check MAP sensor signal between terminal 4 and ground harness side, under the following test conditions:

MAP SENSOR OUTPUT SIGNAL					
MAP SENSOR TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)	
4	MAP sensor	Engine: Running	Engine running: Idle Press accelerator pedal slowly	Approximately 1.3 V	
			Press accelerator pedal quickly	Up to approximately 4 V (instantaneous)	

Is the check result normal?

Yes >> Go to step 9.

No >> Go to the next step.

8. CHECK OR REPLACE THE MAP SENSOR

- Check the sensor as follows:
  - Remove the sensor mounting bolt.
  - Remove the sensor.
  - Visually check the sensor for blockage or damage, and clean the pressure port of the sensor.

Is the check result normal?

Yes >> Replace the MAP sensor with a known good MAP sensor.
Select view DTC on the X-431 screen.
– If DTC P0105 or P0106 is not present, the system is OK.
– If DTC P0105 or P0106 is present, go to step 9.

No >> Clean or replace the MAP sensor.

9. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

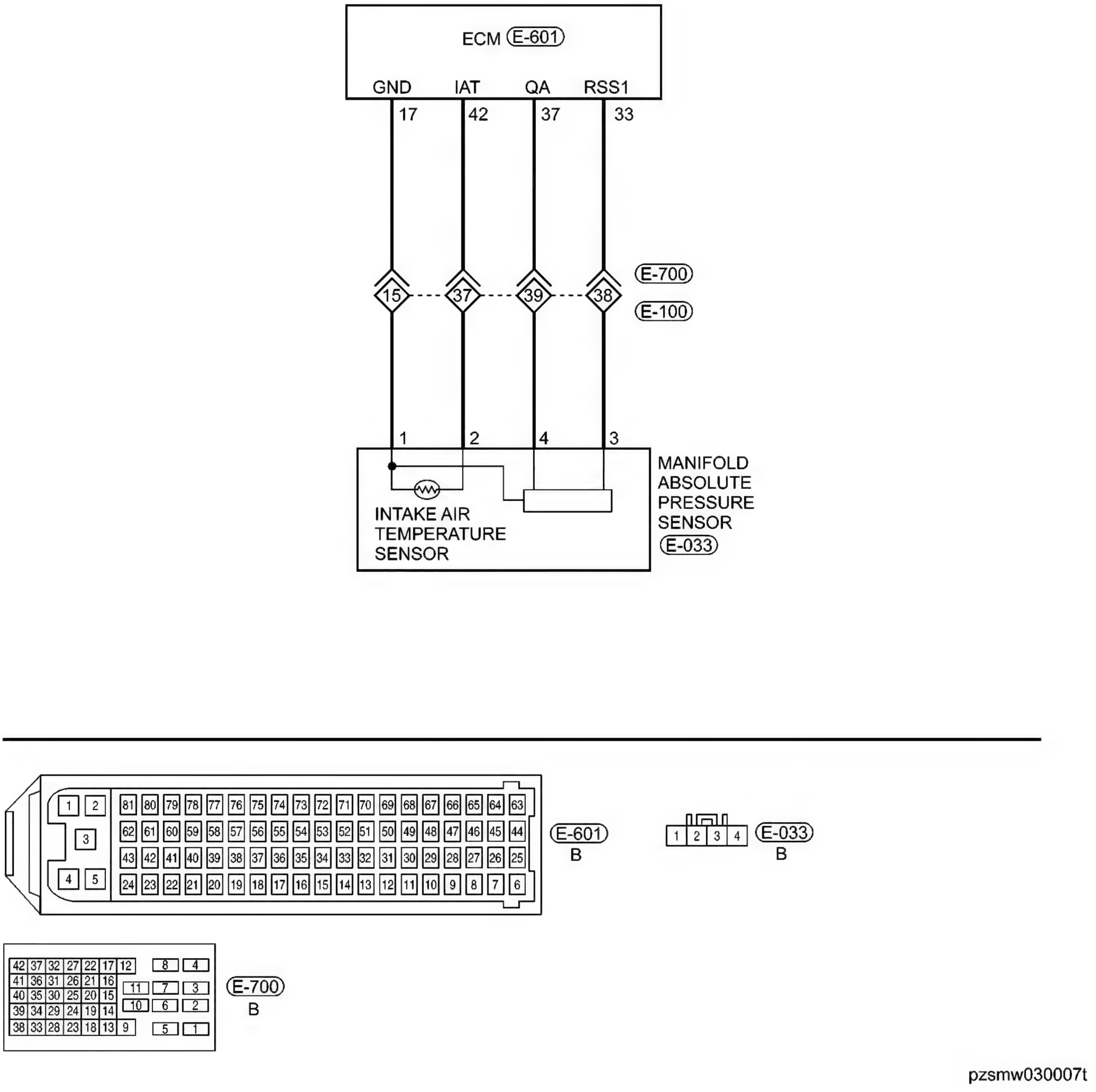
Is DTC P0105 or P0106 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0107 - Manifold Absolute Pressure Or Barometric Pressure Low Input
P0108 - Manifold Absolute Pressure Or Barometric Pressure High Input


ECM (E-601)
GND
IAT
QA
RSS1
17
42
37
33
15
37
39
38
(E-700)
(E-100)
1
2
4
3
INTAKE AIR TEMPERATURE SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
(E-033)
(E-601)
B
(E-033)
B
(E-700)
B
pzsmw030007t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
17	Sensor (GND)	Ignition switch: ON	-	Approximately 0 V
33	Regulated sensor supply 1		-	Approximately 5 V
37	Manifold Absolute Pressure (MAP) sensor		Engine running: Idle	Approximately 1.3 V
			Engine running: 2000 RPM	Approximately 1.5 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0107	Manifold Absolute Pressure or Barometric Pressure low input	Ignition switch ON or after engine is started	Signal output is below minimum acceptable range for a few seconds continuously.	• MAP sensor • Harness or connectors • ECM
P0108	Manifold Absolute Pressure or Barometric Pressure high input		Signal output is above maximum acceptable range for a few seconds continuously.	• MAP sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

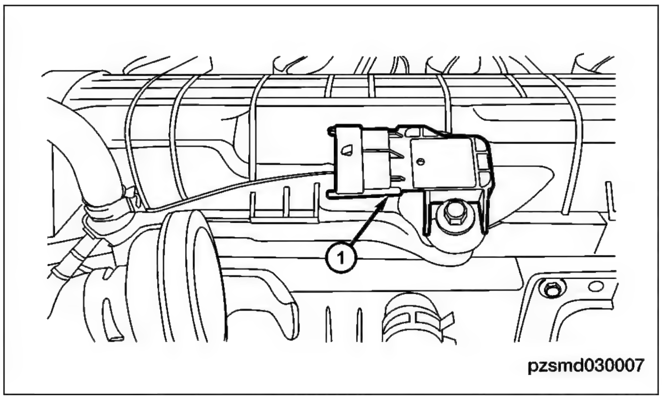
2. CHECK MAP SENSOR ELECTRICAL CONNECTOR

- Disconnect the MAP sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



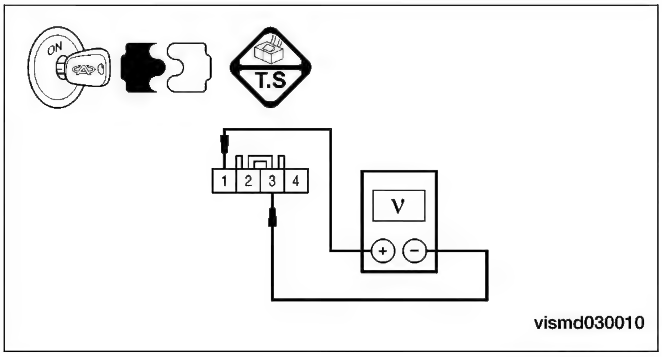
3. CHECK MAP SENSOR POWER SUPPLY

- Turn ignition switch on.
- Check the voltage between terminal 1 and terminal 3 in MAP sensor connector E-033 terminal side.
- 5 V should exist.

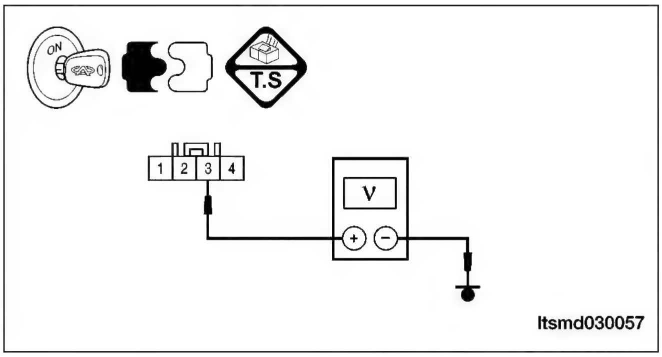
Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



4. CHECK THE MAP SENSOR POWER SUPPLY CIRCUIT FOR AN OPEN OR SHORT



- Check the voltage between terminal 3 and ground in the MAP sensor connector E-033 terminal side.
- Approximately 5 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to ground or short to power in harness or connectors.
If circuit is normal, go to the next step.

5. CHECK THE MAP SENSOR GROUND CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect the ECM electrical connector E-601.
- Check the continuity between MAP sensor terminal 1 and ECM terminal 17.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, high resistance or short to power in harness or connectors.

6. CHECK THE MAP SENSOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

- Check the continuity between MAP sensor terminal 4 and ECM connector E-601, terminal 37 terminal side.
- Continuity should exist.
- Check harness for a short to ground or short to power.

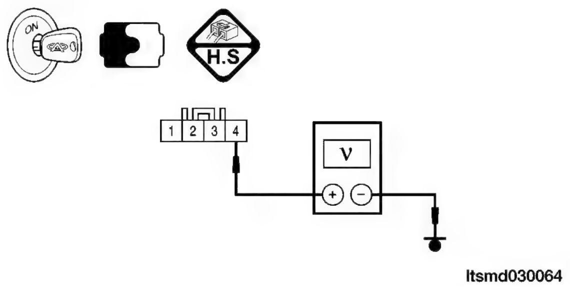
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to ground or short to power in harness or connectors.

7. CHECK THE MAP SENSOR SIGNAL

- Connect the ECM electrical connector.
- Check MAP sensor signal between sensor terminal 4 and ground harness side, under the following test conditions:

MAP SENSOR OUTPUT SIGNAL					
MAP TERMINAL NO.	**ITEM**	**CONDITION**		**DATA (DC VOLTAGE)**	
4	MAP sensor	Engine: Running	• Engine running: Idle • Press accelerator pedal slowly	Approximately 1.3 V	
			• Press accelerator pedal quickly	Up to approximately 4 V (Instantaneous)	

Is the check result normal?

Yes >> Go to step 9.

No >> Go to the next step.

8. CHECK AND REPLACE THE MAP SENSOR

- Check the sensor as follows:
  - Remove the sensor mounting bolt.
  - Remove the sensor.
  - Visually check the sensor for blockage or damage, and clean the pressure port of the sensor.

Is the check result normal?

Yes >> Replace the MAP sensor with a known good MAP sensor.
Select view DTC on the X-431 screen.
– If DTC P0107 or P0108 is not present, the system is OK.
– If DTC P0107 or P0108 is present, go to step 9.

No >> Clean or replace the MAP sensor.

9. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

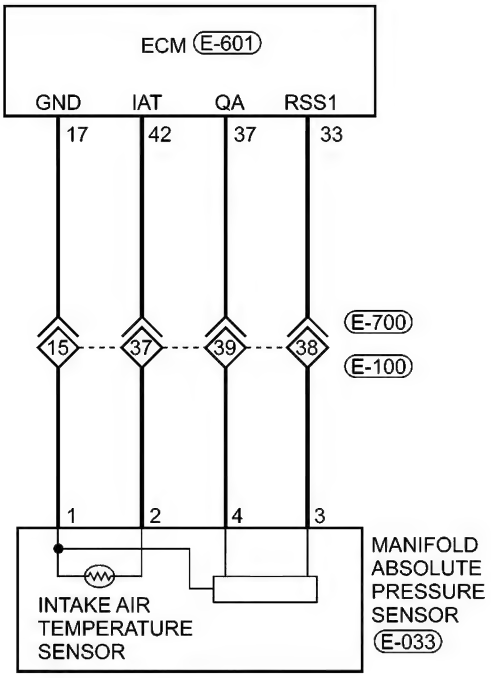
Is DTC P0107 or P0108 still present?

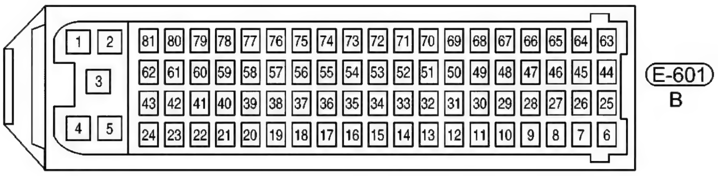
Yes >> Replace the ECM.

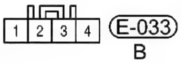
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

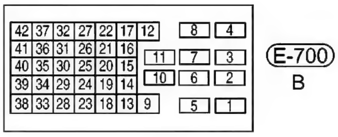
No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0112 - Intake Air Temperature Circuit Low Input


ECM E-601
GND
IAT
QA
RSS1
17
42
37
33
15
37
39
38
E-700
E-100
1
2
4
3
INTAKE AIR TEMPERATURE SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
E-033


1 2 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
3 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B




42 37 32 27 22 17 12 8 4
41 36 31 26 21 16 11 7 3
40 35 30 25 20 15 10 6 2
39 34 29 24 19 14
38 33 28 23 18 13 9 5 1
E-700
B

pzsmw030007t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
17	Sensor (GND)	Ignition switch: ON		0 V
42	Intake Air Temperature (IAT) sensor	Ignition switch: ON	IAT: 36°C	Approximately 1.88 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0112	Intake air temperature circuit low input	Ignition switch ON or after engine is started	When output signal is wrong or out of acceptable range.	• MAP/IAT sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

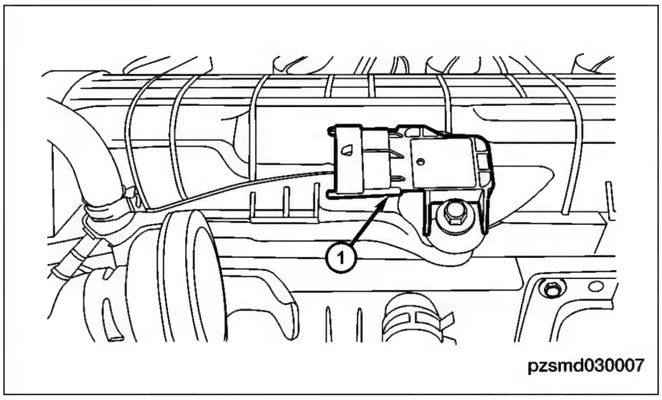
- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. CHECK MAP/IAT SENSOR ELECTRICAL CONNECTOR



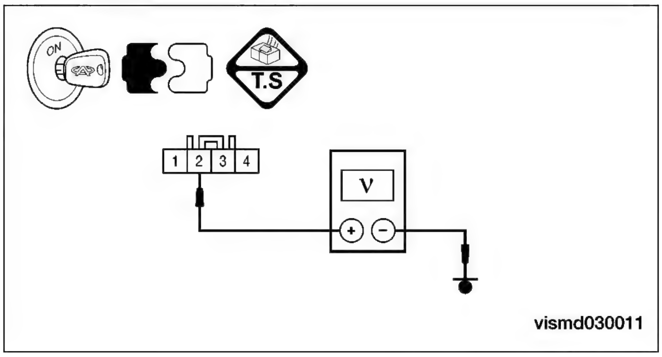
- Disconnect the MAP/IAT sensor (1) electrical connector E-033.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

3. CHECK THE IAT SENSOR SIGNAL CIRCUIT



- Turn ignition switch on.
- Check the voltage between terminal 2 and ground in the MAP/IAT sensor connector E-003 terminal side.
- 5 V should exist.

Is the check result normal?

Yes >> Go to Step 5.

No >> Go to the next step.

4. DETECT MALFUNCTIONING PART

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check the harness for a short to ground between MAP/IAT connector terminal 2 and ECM connector E-601, terminal 42.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for a short to ground in harness or connectors.

5. CHECK THE IAT SENSOR

- Connect MAP/IAT sensor electrical connector.
- Connect the ECM electrical connector.
- Turn ignition switch on.
- Check the IAT signal between terminal 2 and ground in MAP/IAT sensor connector E-033 harness side, under the following test conditions:

IAT SENSOR OUTPUT SIGNAL REFERENCE DATA				
IAT SENSOR TERMINAL NO.	**ITEM**	**CONDITION**		**DATA (DC VOLTAGE)**
2	IAT sensor	Ignition switch: ON	IAT: 36°C	1.88 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the MAP/IAT sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

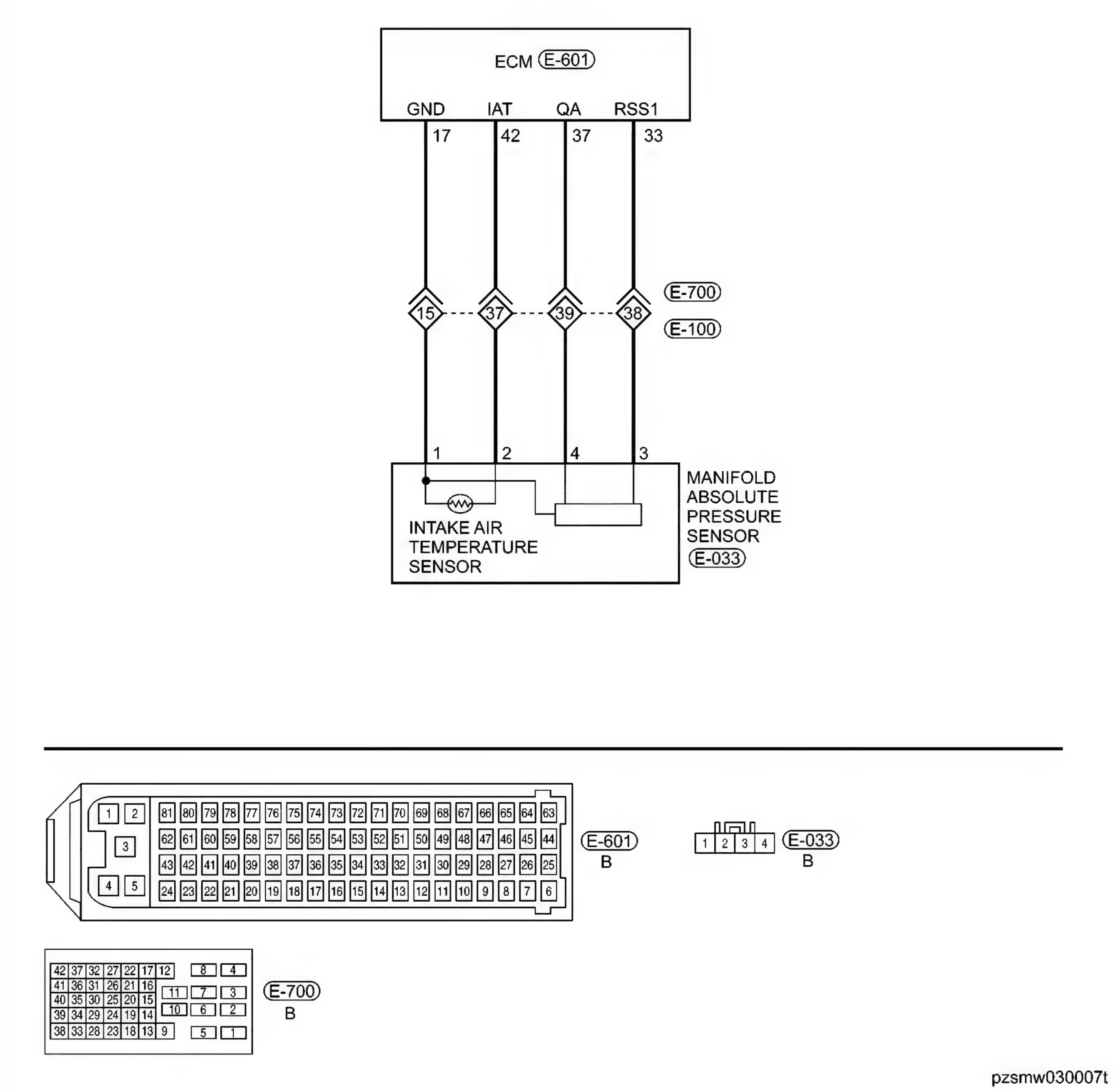
Is DTC P0112 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0113 - Intake Air Temperature Circuit High Input


ECM E-601
GND
IAT
QA
RSS1
17
42
37
33
E-700
E-100
15
37
39
38
1
2
4
3
INTAKE AIR TEMPERATURE SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
E-033
E-601
B
E-033
B
E-700
B
pzsmw030007t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
17	Sensor (GND)	Ignition switch: ON		0 V
42	Intake Air Temperature (IAT) sensor	Ignition switch: ON	IAT: 36°C	Approximately 1.88 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0113	Intake air temperature circuit high input	Ignition switch ON or after engine is started	Output signal is wrong or out of acceptable range.	• IAT sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

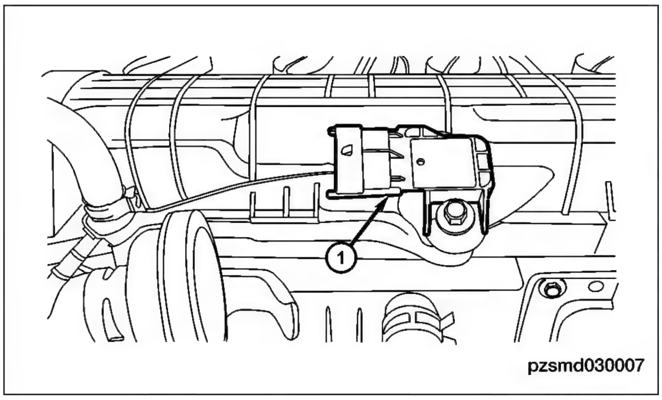
2. CHECK MAP/IAT SENSOR ELECTRICAL CONNECTOR

- Disconnect the MAP/IAT sensor (1) electrical connector E-033.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



pzsmd030007

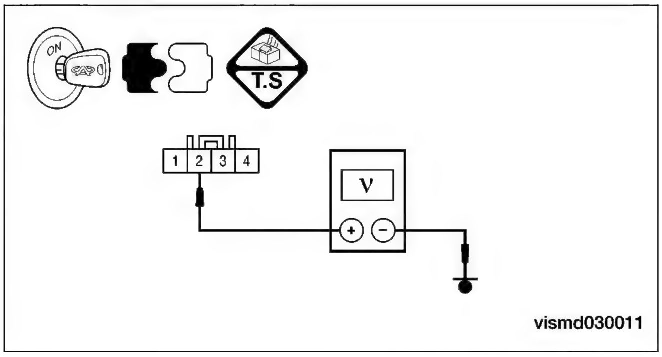
3. CHECK THE IAT SENSOR SIGNAL CIRCUIT

- Turn ignition switch on.
- Check the voltage between terminal 2 and ground in the IAT sensor connector E-033 terminal side.
- 5 V should exist.

Is the check result normal?

Yes >> Go to the next step.

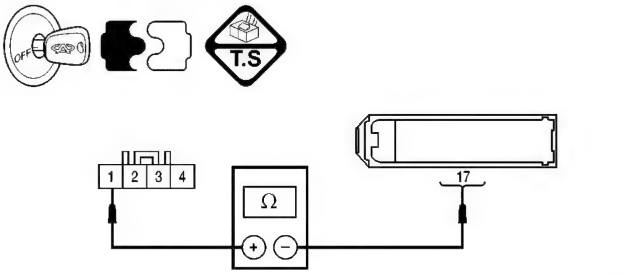
No >> Repair circuit for an open or short to power in harness or connectors.
If circuit is normal, go to the next step.



vismd030011

4. CHECK THE IAT SENSOR GROUND CIRCUIT FOR OPEN OR SHORT

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check the continuity between IAT sensor terminal 1 and ECM terminal 17 terminal side.

CHECK SENSOR GROUND CIRCUIT		
IAT SENSOR CONNECTOR TERMINAL	ECM CONNECTOR TERMINAL	 vismd030012
1	17	

- Continuity should exist.
- Check harness for a short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or short to power in harness or connectors.

5. CHECK THE IAT SENSOR

- Connect the IAT sensor electrical connector.
- Connect the ECM electrical connector.
- Turn ignition switch on.
- Check the IAT signal between terminal 2 and ground in MAP sensor connector E-033 harness side, using the following test conditions:

IAT SENSOR OUTPUT SIGNAL REFERENCE DATA				
IAT SENSOR TERMINAL NO.	**ITEM**	**CONDITION**		**DATA (DC VOLTAGE)**
2	IAT sensor	Ignition switch: ON	IAT: 36°C	1.88 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the MAP/IAT sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

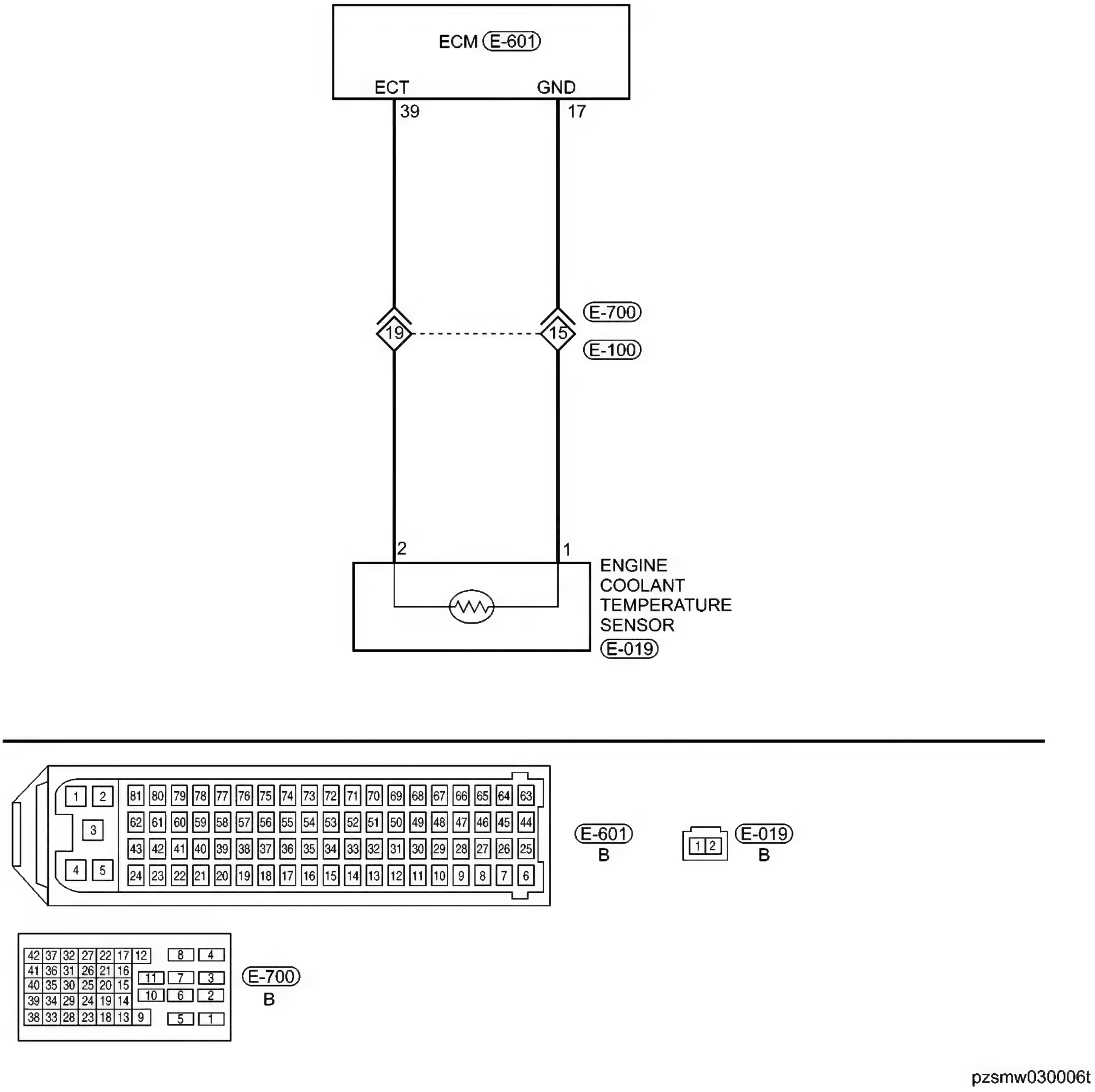
Is DTC P0113 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0117 - Engine Coolant Temperature Circuit Low Input


ECM E-601
ECT
GND
39
17
19
15
E-700
E-100
2
1
ENGINE
COOLANT
TEMPERATURE
SENSOR
E-019
E-601
B
E-019
B
E-700
B
pzsmw030006t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
17	Sensor (GND)	Ignition switch: ON	-	Approximately 0 V
39	Engine Coolant Temperature (ECT) sensor		ECT: 59°C	1.89 V
			ECT: 78°C	1.25 V
			ECT: 90°C	0.94 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0117	Engine coolant temperature circuit low input	Ignition switch ON or after engine is started	Signal output is below minimum acceptable range for a few seconds continuously.	• ECT sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

- Before performing this DTC diagnostic procedure, verify that the Engine coolant temperature is normal.

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

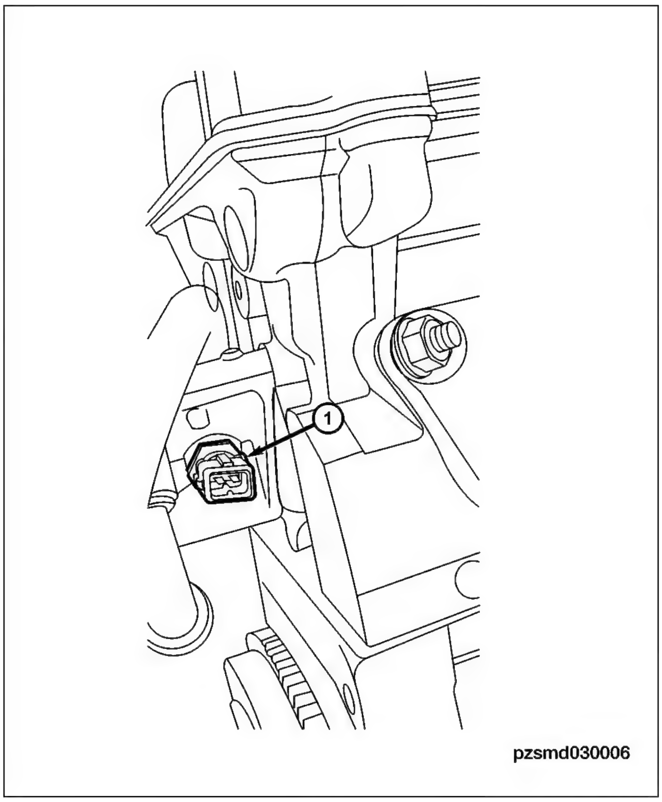
2. CHECK ECT SENSOR ELECTRICAL CONNECTOR

- Disconnect the ECT sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



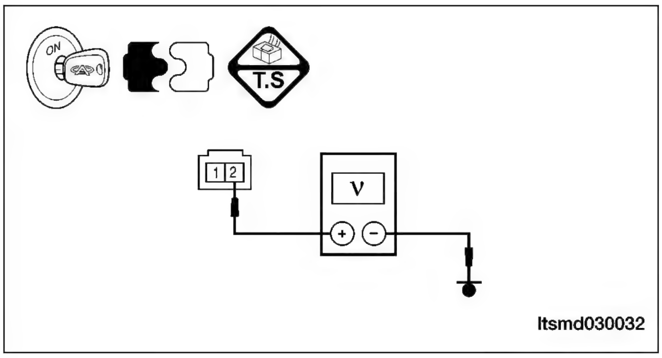
3. CHECK THE ENGINE ECT SENSOR SIGNAL CIRCUIT FOR A SHORT

- Turn ignition switch on.
- Check the ECT sensor reference voltage between sensor terminal 2 and ground in sensor connector E-019 terminal side.
- 4.5 - 4.9 V should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



4. DETECT MALFUNCTIONING PART

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check the harness for a short to ground between the ECT sensor connector terminal 2 and ECM connector E-601, terminal 39.

Is the check result normal?

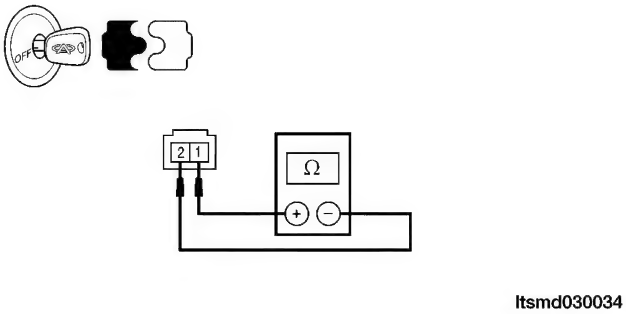
Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair or replace the circuit for a short in harness or connectors.

5. CHECK ECT SENSOR

- Check resistance between the ECT sensor terminals 1 and 2, component side:

<table>
<tr><th colspan="3">ECT RESISTANCE REFERENCE DATA</th></tr>
<tr><th>ECT °C</th><th>RESISTANCE KΩ</th><td rowspan="4">
</td></tr>
<tr><td>-10°C</td><td>8.62 - 10.28</td></tr>
<tr><td>20°C</td><td>2.37 - 2.63</td></tr>
<tr><td>80°C</td><td>0.299 - 0.345</td></tr>
</table>

- Connect ECT sensor electrical connector.
- Connect the ECM electrical connector.
- Turn ignition switch on.
- Check sensor output signal.

<table>
<tr><th colspan="5">ECT SENSOR OUTPUT SIGNAL REFERENCE DATA</th></tr>
<tr><th>ECT TERMINAL NO.</th><th>ITEM</th><th colspan="2">CONDITION</th><th>DATA (DC VOLTAGE)</th></tr>
<tr><td>17</td><td>Sensor (GND)</td><td rowspan="4">Ignition switch: ON</td><td>-</td><td>Approximately 0 V</td></tr>
<tr><td rowspan="3">39</td><td rowspan="3">ECT sensor</td><td>ECT: 59°C</td><td>1.89 V</td></tr>
<tr><td>ECT: 78°C</td><td>1.25 V</td></tr>
<tr><td>ECT: 90°C</td><td>0.94 V</td></tr>
</table>

Is the check result normal?

Yes >> Go to the next step.

No >> Replace ECT sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

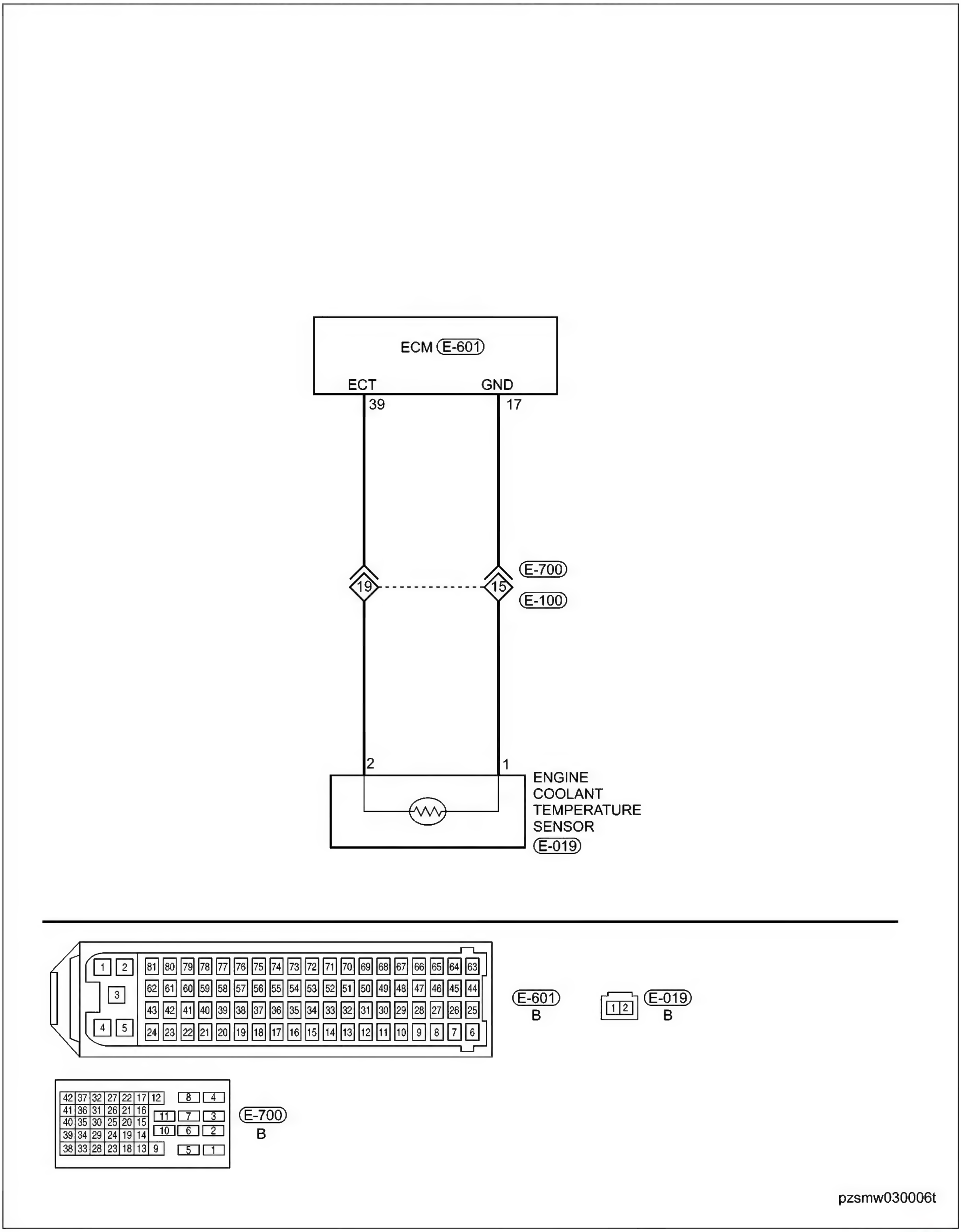
Is DTC P0117 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0118 - Engine Coolant Temperature Circuit High Input


ECM E-601
ECT
GND
39
17
E-700
E-100
19
15
2
1
ENGINE COOLANT TEMPERATURE SENSOR
E-019
1 2 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
3 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B
1 2
E-019
B
42 37 32 27 22 17 12 8 4
41 36 31 26 21 16 11 7 3
40 35 30 25 20 15 10 6 2
39 34 29 24 19 14
38 33 28 23 18 13 9 5 1
E-700
B
pzsmw030006t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
17	Sensor (GND)	Ignition switch: ON	-	Approximately 0 V
39	Engine Coolant Temperature (ECT) sensor		Engine coolant temperature: 59°C	Approximately 1.89 V
			Engine coolant temperature: 78°C	Approximately 1.25 V
			Engine coolant temperature: 90°C	Approximately 0.94 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0118	Engine coolant temperature circuit high input	Ignition switch ON or after engine is started	Signal output is above maximum acceptable range for a few seconds continuously.	• ECT sensor • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

- Before performing this DTC diagnostic procedure, verify that the engine coolant temperature is normal.

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

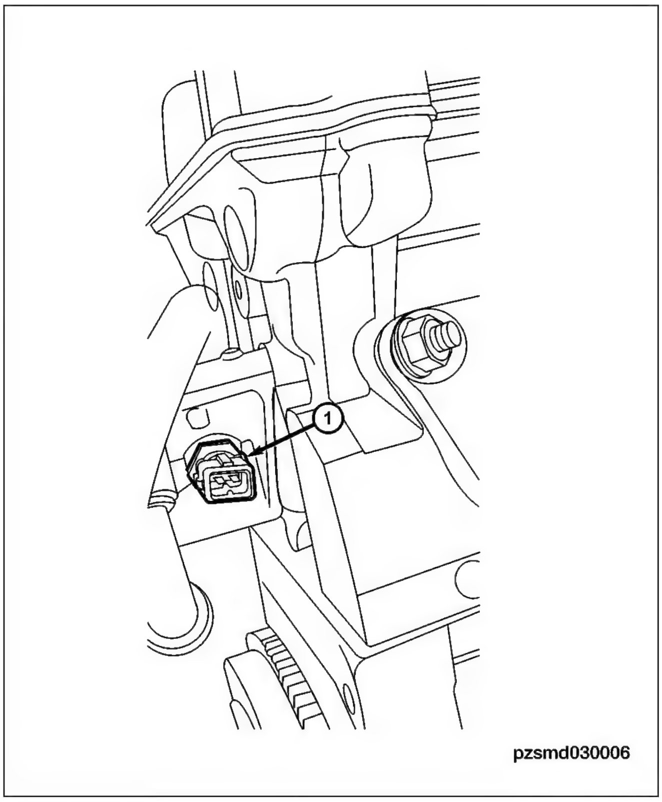
- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. CHECK ECT SENSOR ELECTRICAL CONNECTOR



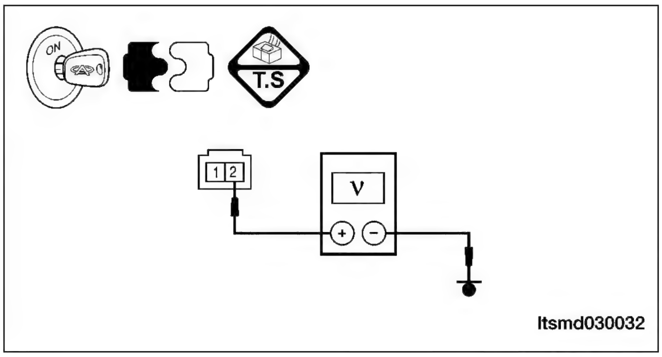
- Disconnect the ECT sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

3. CHECK ECT SENSOR SIGNAL CIRCUIT FOR A SHORT



- Turn ignition switch on.
- Check the ECT sensor reference voltage between sensor terminal 2 and ground in sensor connector E-019 terminal side.
- 5 V should exist.

Is the check result normal?

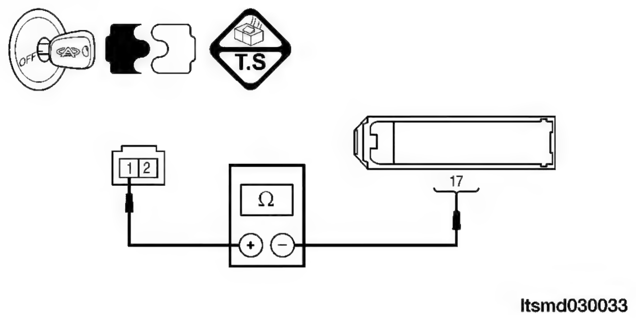
Yes >> Go to the next step.

No >> Repair or replace the harness for an open or short to power between ECT connector terminal 2 and ECM connector E-001, terminal 39.
If harness is normal, replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

4. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN OR SHORT TO POWER

- Turn ignition switch off.
- Check continuity between the following terminals.

SENSOR GROUND CIRCUIT			
ECT SENSOR TERMINAL	**ECM TERMINAL**	**CONTINUITY**	
1	17	Yes	

- Continuity should exist.
- Check harness for a short to power.

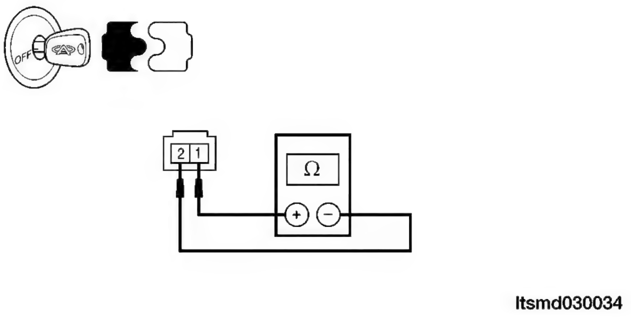
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or short to power in harness or connectors.

5. CHECK ECT SENSOR

- Check resistance between the ECT sensor terminals 1 and 2, component side:

ECT RESISTANCE REFERENCE DATA		
ECT °C	**RESISTANCE KΩ**	
-10°C	8.62 - 10.28	
20°C	2.37 - 2.63	
80°C	0.299 - 0.345	

- Connect ECT sensor electrical connector.
- Connect the ECM electrical connector.
- Turn ignition switch on.
- Check sensor output signal.

ECT SENSOR OUTPUT SIGNAL REFERENCE DATA				
ECT TERMINAL NO.	**ITEM**	**CONDITION**		**DATA (DC VOLTAGE)**
17	Sensor (GND)	Ignition switch: ON	-	Approximately 0 V
39	ECT sensor		ECT: 59°C	1.89 V
			ECT: 78°C	1.25 V
			ECT: 90°C	0.94 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace ECT sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

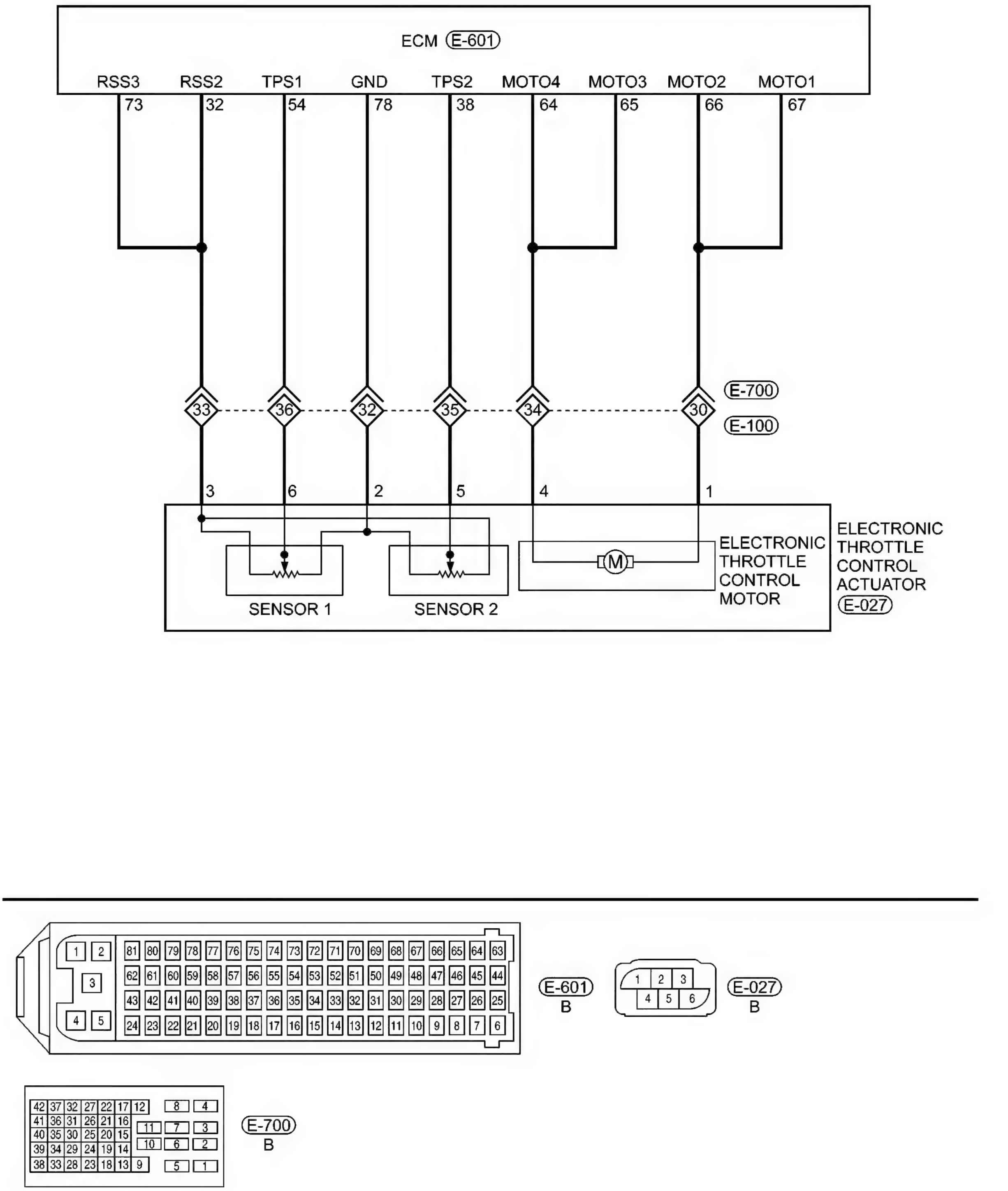
Is DTC P0118 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0122 - Throttle Position Sensor A Circuit Low Input
P0123 - Throttle Position Sensor A Circuit High Input


ECM (E-601)
RSS3
RSS2
TPS1
GND
TPS2
MOTO4
MOTO3
MOTO2
MOTO1
73
32
54
78
38
64
65
66
67
33
36
32
35
34
30
(E-700)
(E-100)
3
6
2
5
4
1
SENSOR 1
SENSOR 2
M
ELECTRONIC THROTTLE CONTROL MOTOR
ELECTRONIC THROTTLE CONTROL ACTUATOR (E-027)
(E-601) B
(E-027) B
(E-700) B

pzsmw030003t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
32	Regulated sensor supply 2	Ignition switch: ON	-	Approximately 5 V
38	Electronic throttle control actuator (Position Sensor)		Engine stopped Accelerator pedal: Fully released	4.24 V
			Engine stopped Accelerator pedal: Fully depressed	0.72 V
54	Electronic throttle control actuator		Engine stopped Accelerator pedal: Fully released	0.74 V
			Engine stopped Accelerator pedal: Fully depressed	4.62 V
64	Electronic throttle control actuator		-	12 or 0 V
65	Electronic throttle control actuator			
66	Electronic throttle control actuator			0 or 12 V
67	Electronic throttle control actuator			
73	Regulated sensor supply 3			Approximately 5 V
78	Sensor (GND)			Approximately 0 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0122	Throttle position sensor A circuit low input	Ignition switch ON or after engine is started	Signal output is below minimum acceptable range for a few seconds continuously.	• TPS or misalignment • Harness or connectors • ECM
P0123	Throttle position sensor A circuit high input		Signal output is above maximum acceptable range for a few seconds continuously.	• TPS or misalignment • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.

- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

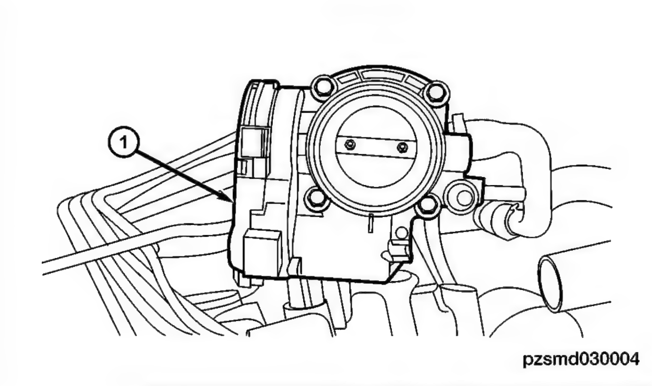
2. CHECK TPS ELECTRICAL CONNECTOR

- Disconnect the TPS (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



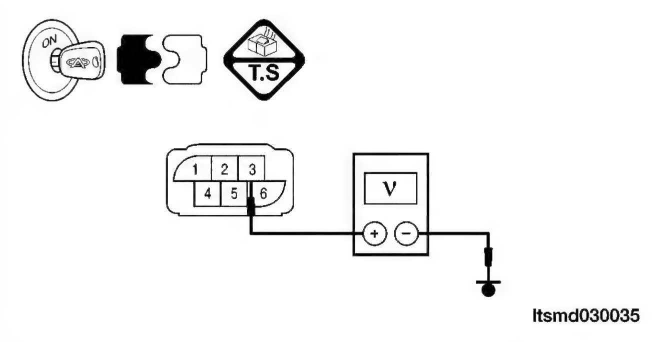
3. CHECK THE TPS POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check the throttle position sensor voltage between terminal 3 and ground in connector E-027, terminal side.
- 5 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open, short to ground or short to power in harness or connectors.
If the circuit is normal, go to the next step.



4. CHECK TPS SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check continuity between the following terminals:

TPS SIGNAL CIRCUIT	
TPS TERMINAL	**ECM TERMINAL**
6	54
5	38

- Continuity should exist.
- Check harness for short to power or short to ground.

Is the check result normal?

Yes >> Go to step 6.

No >> Go to the next step.

5. DETECT MALFUNCTIONING PART

- Check the harness for an open, a short to ground or a short to power between TPS connector terminal 2 and ECM connector E-601, terminal 78

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace harness or connectors.

6. CHECK THE TPS RESISTANCE

- Check the resistance between TPS terminals 2 and 3.
- 2 kΩ ± 20 % (20°C) should exist.
- Slowly open the throttle, the TPS resistance value should change in a linear movement with the throttle as it opens.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the TPS.
Perform the TPS self-learning procedure.

7. CHECK THE TPS

- Turn ignition switch off.
- Connect the ECM electrical connector.
- Connect TPS connector.
- Turn ignition switch on.
- Check voltage between the TPS terminal 3 and ground under the following conditions:

TPS OUTPUT SIGNAL				
TERMINAL NO.	**ITEM**	**CONDITION**		**DATA (DC VOLTAGE)**
32	Regulated sensor supply 2	Ignition switch: ON	-	Approximately 5 V
38	Electronic throttle control actuator (Position Sensor)		Engine stopped Accelerator pedal: Fully released	4.24 V
			Engine stopped Accelerator pedal: Fully depressed	0.72 V
54	Electronic throttle control actuator		Engine stopped Accelerator pedal: Fully released	0.74 V
			Engine stopped Accelerator pedal: Fully depressed	4.62 V
64	Electronic throttle control actuator		-	12 V or 0 V
65	Electronic throttle control actuator			
66	Electronic throttle control actuator			0 V or 12 V
67	Electronic throttle control actuator			
73	Regulated sensor supply 3			Approximately 5 V
78	Sensor (GND)			Approximately 0 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the TPS.
Perform the TPS self-learning.

8. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

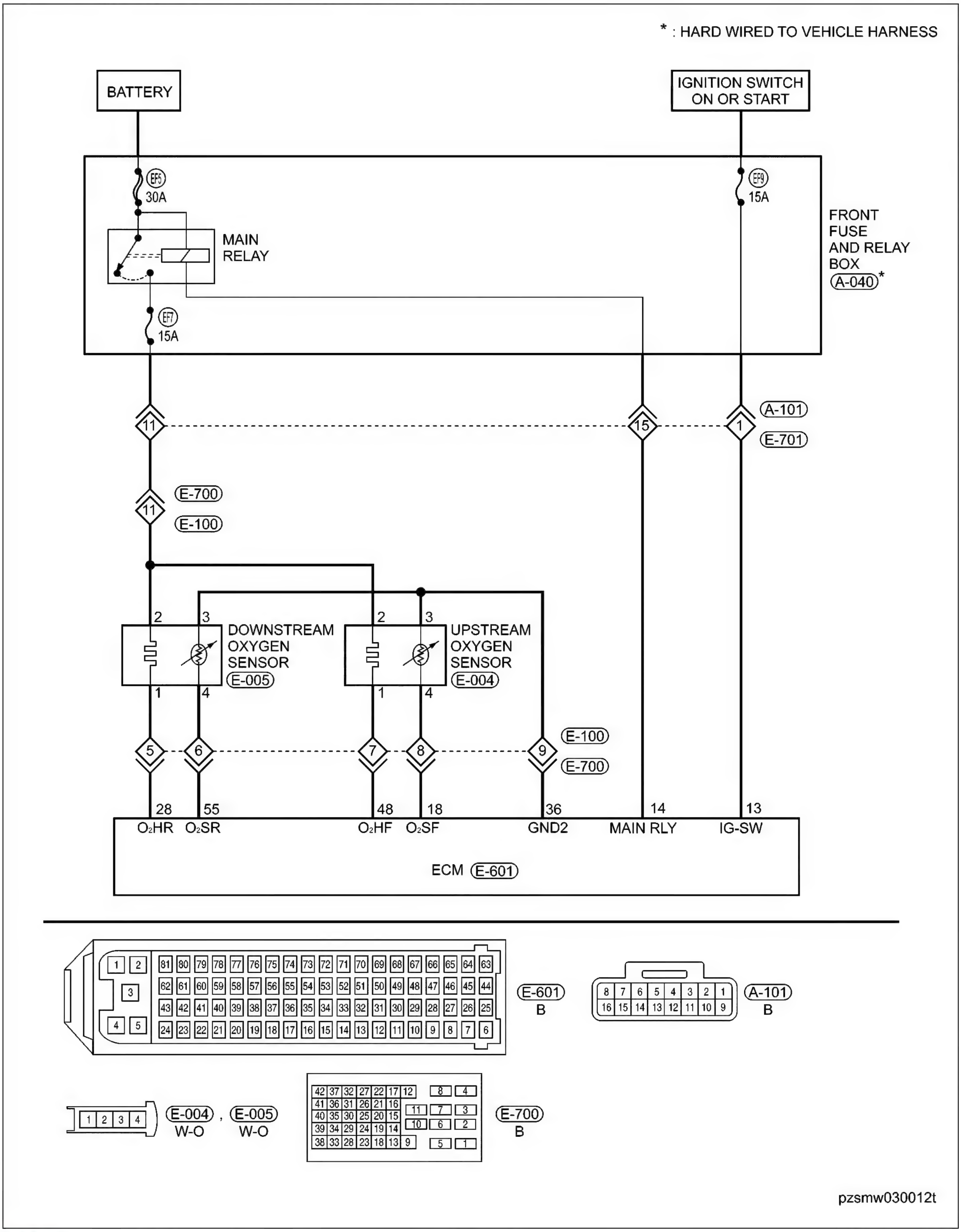
Is DTC P0122 or P0123 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0132 - O_2 Sensor Circuit 1 High Voltage


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5
30A
EF9
15A
MAIN RELAY
EF7
15A
FRONT FUSE AND RELAY BOX
A-040*
11
15
1
A-101
E-701
11
E-700
E-100
2
3
DOWNSTREAM OXYGEN SENSOR
E-005
1
4
2
3
UPSTREAM OXYGEN SENSOR
E-004
1
4
5
6
7
8
9
E-100
E-700
28
55
48
18
36
14
13
O2HR
O2SR
O2HF
O2SF
GND2
MAIN RLY
IG-SW
ECM
E-601
E-601
B
A-101
B
E-004
W-O
E-005
W-O
E-700
B
pzsmw030012t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (DC VOLTAGE)
18	Upstream O_2 sensor	Engine is running Warm-up condition	Approximately 0.1 V - 0.9 V (change 5 - 8 times in 10 seconds periodically)
28	Downstream O_2 sensor heating	-	-
36	Sensor (GND)	Warm-up condition Idle	Approximately 0 V
48	Upstream O_2 sensor heating	-	-
55	Downstream O_2 sensor	Engine is running Warm-up condition	Approximately 100 mV

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0132	O_2 sensor 1 (upstream) circuit high voltage	Engine is running	• Fuel quality • Oxygen sensor 1 (upstream) • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- Turn ignition switch off and wait at least 10 seconds.
- Start engine and keep the engine speed 2000 RPM for at least 1 minute.
- Let engine idle for 2 minutes.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

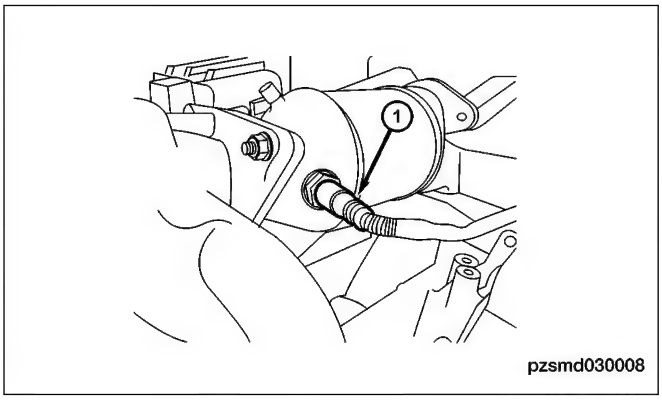
2. CHECK UPSTREAM O_2 SENSOR ELECTRICAL CONNECTOR

- Disconnect the upstream O_2 sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



3. CHECK THE UPSTREAM O_2 SENSOR GROUND CIRCUIT

- Disconnect the ECM electrical connector.
- Check continuity between ECM terminal 18 and O_2 sensor terminal 4.
- Continuity should exist.
- Check the harness for an open and a short to power supply circuit.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to power in harness or connectors.

4. CHECK O_2 SENSOR INPUT SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Check the continuity between ECM terminal and O_2 sensor terminal as follows:

O_2 SENSOR SIGNAL CIRCUIT	
COMPONENT	**TERMINAL**
ECM	18
Upstream Oxygen Sensor	4

- Continuity should exist.
- Check the harness for a short to power supply circuit.

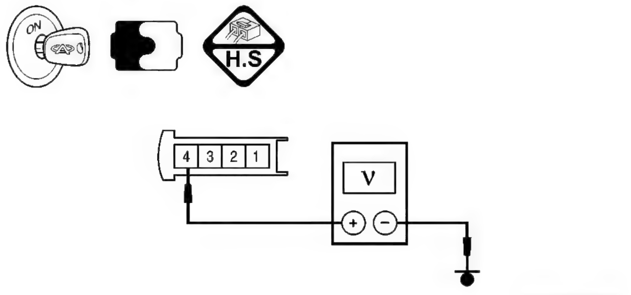
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or short to power in harness or connectors.

5. CHECK O_2 SENSOR

- Connect O_2 sensor electrical connector.
- Connect the ECM electrical connector.
- If using the X-431, reference the data stream value.
- If not using the X-431, perform the following:
  - Start engine and warm it up to normal operating temperature 90°C.
  - Turn ignition switch off.
  - Start engine and maintain the engine speed between 3,500 RPM and 4,000 RPM for at least 1 minute.
  - Let engine idle for 1 minute.
- Connect digital multimeter probes between ECM terminal 4 and ground, harness side.

O_2 SENSOR OUTPUT SIGNAL				
CHECK ITEM	**CHECK CONTENT**		**NORMAL VALUE**	
Oxygen sensor	• Warm-up condition • Become lean while decelerate	Decelerate from approximately 4,000 RPM suddenly	Below 100 mV	 ltsmd030039
	• Warm-up condition • Become rich while accelerate	Accelerate suddenly	Approximately 600 - 900 mV	
	• Warm-up condition • Check with O_2 sensor signal	Idle	100 - 900 mV	
		Approximately 2500 RPM	Approximately 600 - 900 mV	

Is the check result normal?

Yes >> Go to the next step.

No >> Replace O_2 sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

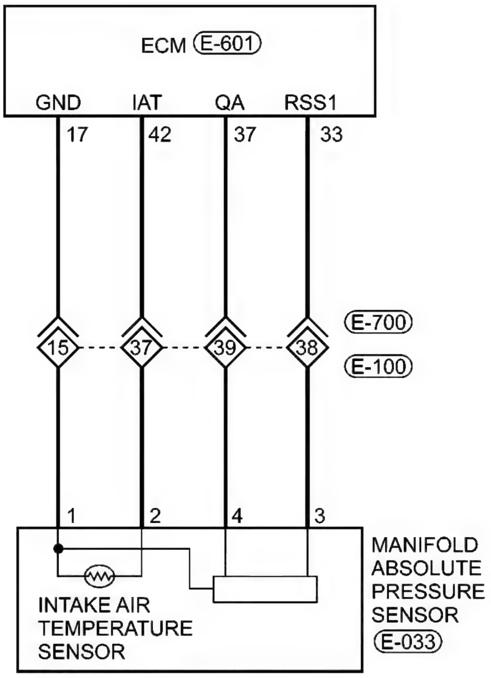
Is DTC P0132 still present?

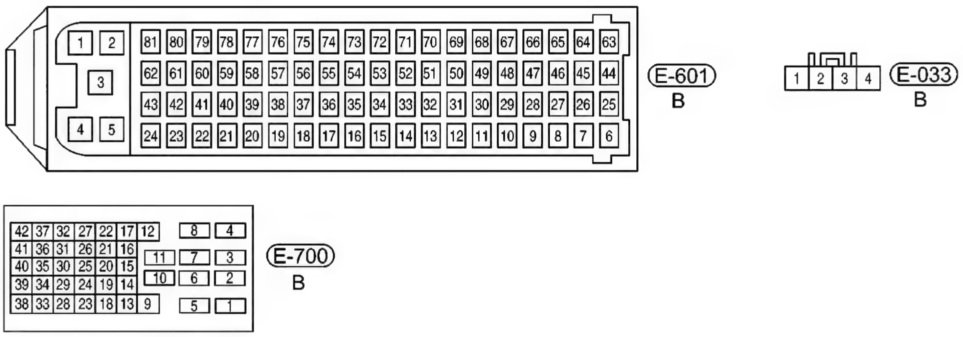
Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

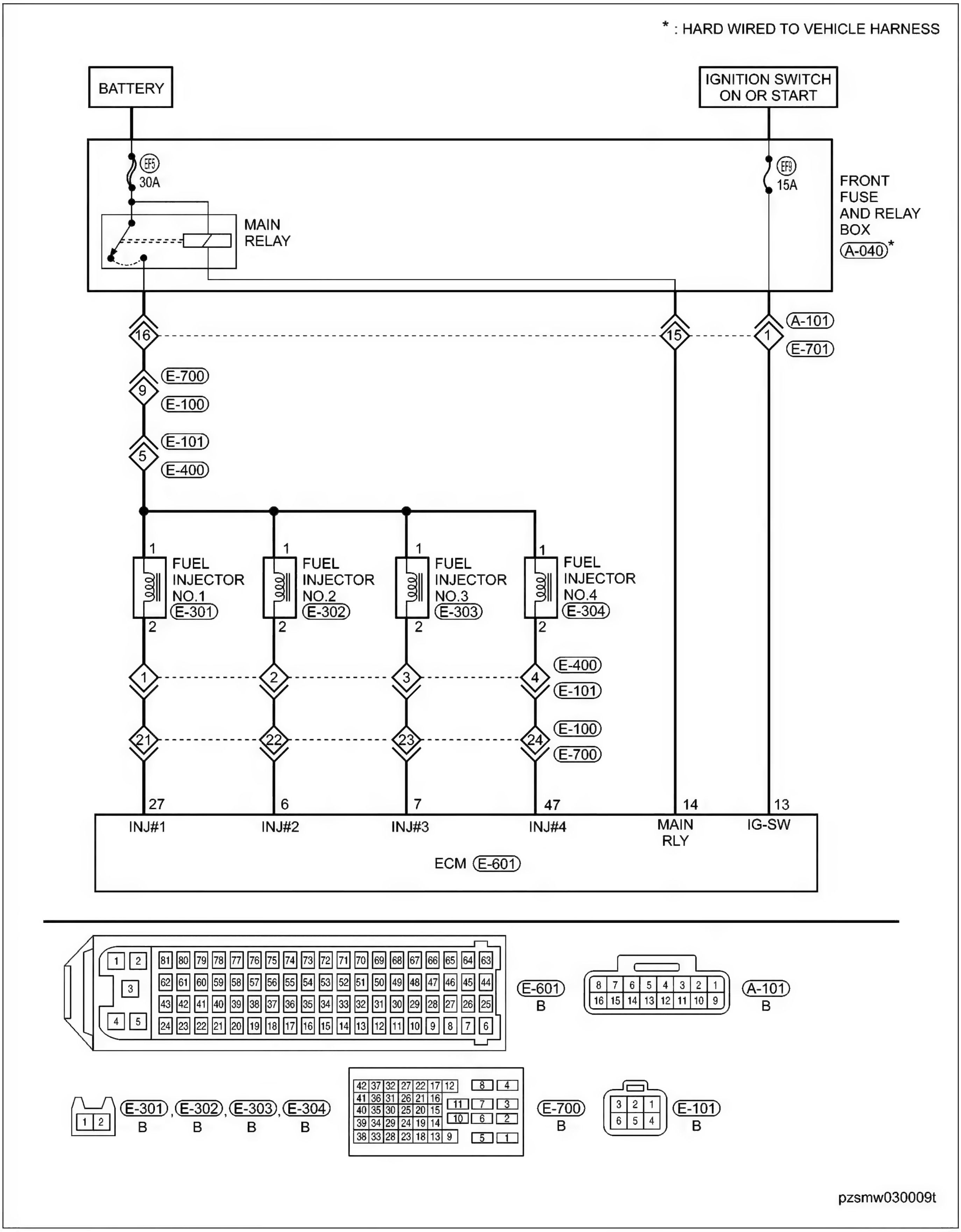
No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0171 - Fuel Trim System Too Lean


ECM E-601
GND
IAT
QA
RSS1
17
42
37
33
15
37
39
38
E-700
E-100
1
2
4
3
MANIFOLD ABSOLUTE PRESSURE SENSOR
E-033
INTAKE AIR TEMPERATURE SENSOR


E-601
B
E-033
B
E-700
B

pzsmw030007t


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5
30A
EF9
15A
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
16
15
1
A-101
E-701
9
E-700
E-100
5
E-101
E-400
1
FUEL INJECTOR NO.1
E-301
FUEL INJECTOR NO.2
E-302
FUEL INJECTOR NO.3
E-303
FUEL INJECTOR NO.4
E-304
2
1
2
3
4
E-400
E-101
21
22
23
24
E-100
E-700
27
6
7
47
14
13
INJ#1
INJ#2
INJ#3
INJ#4
MAIN RLY
IG-SW
ECM
E-601
E-601
B
A-101
B
E-301, E-302, E-303, E-304
B B B B
E-700
B
E-101
B
pzsmw030009t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	Engine is running Idle Warm-up condition Accelerate suddenly	Voltage: 11-14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
17	Sensor (GND)	-	0 V
33	Regulated sensor supply 1	Ignition switch: ON	Approximately 5 V
37	Manifold Absolute Pressure (MAP) sensor	Engine running: Idle Press accelerator pedal slowly	Approximately 1.3 V
		Engine running: 2000 RPM	Approximately 1.5 V
		Press accelerator pedal quickly	Up to approximately 4 V (Instantaneous)

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0171	Fuel trim system too lean	Engine is running	The amount of mixture ratio compensation is too large (The mixture ratio is too lean).	• Intake air leaks • MAP sensor • MAF sensor • Fuel injector • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Incorrect PCV hose connection • Upstream O_2 sensor • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start engine and warm it to normal operating temperature, then select view DTC and data stream.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK EXHAUST GAS LEAK

- Start engine and run it at idle.
- Listen for any exhaust gas leaks before the three way catalyst.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair the leak as necessary.

2. CHECK FOR INTAKE AIR LEAK

- Allow engine to idle.
- Listen for intake air leak after the MAP sensor.
- Check PCV hose connector.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace as necessary.

3. CHECK ECM CONTROL SIGNAL IN DATA STREAM

- With X-431, select view data stream and review the following data:

INJECTOR REFERENCE DATA			
MONITOR ITEM	**CONDITION**		**DATA**
Injector pulse	Engine Temp: Warm-up 78°C Transaxle Position: N Air Conditioner: Off Engine load: No load	Idle	Approximately 2.5 ms

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.

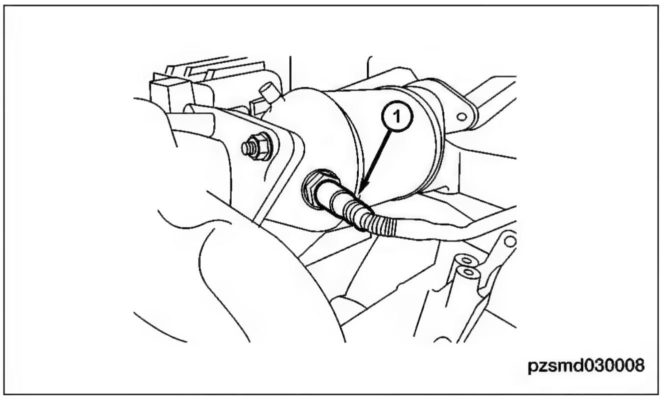
4. CHECK UPSTREAM O_2 SENSOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the upstream O_2 sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



5. CHECK UPSTREAM O_2 SENSOR SIGNAL CIRCUIT

- Disconnect the ECM electrical connector.
- Check the continuity between the following terminals:

O_2 SENSOR CIRCUIT		
COMPONENT	**ECM TERMINAL**	**O_2 SENSOR TERMINAL**
TERMINAL	36	3
	18	4

- Continuity should exist.
- Check harness for a short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or short to ground in harness or connectors.

6. CHECK THE MAP OR MAF SENSOR SIGNAL

- Check MAP signal in data stream and review the following data:

MAP SIGNAL DATA				
ECM TERMINAL NO.	**ITEM**	**CONDITION**		**DATA (DC VOLTAGE)**
37	Manifold Absolute Pressure (MAP) sensor	Engine: Running	Engine running: Idle Press accelerator pedal slowly	Approximately 1.3 V
			Engine running: 2000 RPM	Approximately 1.5 V
			Press accelerator pedal quickly	Up to Approximately 4 V (instantaneous)

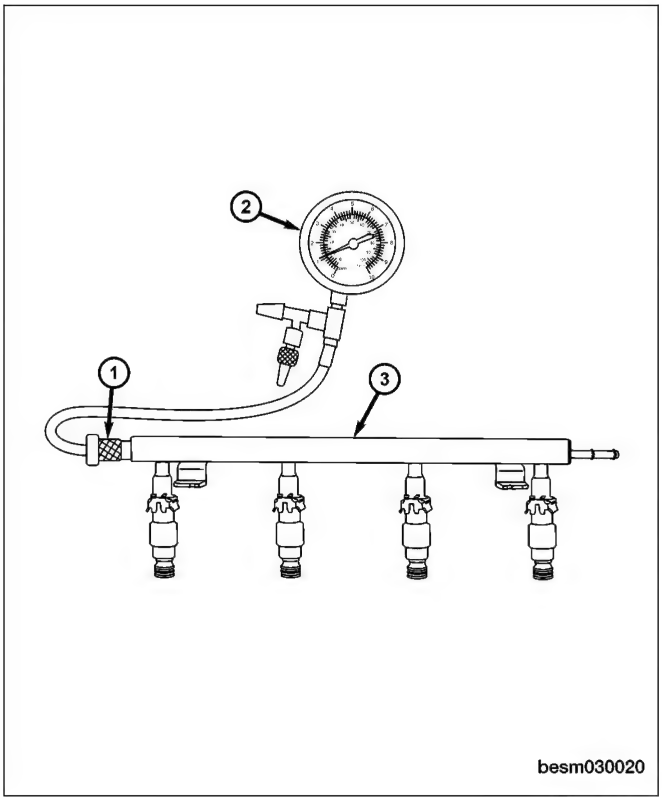
Is the check result normal?

Yes >> Go to the next step.

No >> Check connectors for rusted terminals or loose connectors in the MAP or MAF sensor circuit or ground.

7. CHECK FUEL PRESSURE

- Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
- Install fuel pressure gauge (2) and check the fuel pressure (See Fuel Pressure Test in Section 04 Fuel Delivery).



- Observe the following fuel pressures when testing:

FUEL PRESSURES	
Key On	400 kPa (4.0 bar)
Key Off	380 kPa (3.8 bar) in 10 minutes
Engine Idle	400 - 420 kPa (4.0 - 4.2 bar)

Is the check result normal?

Yes >> Go to step 9.

No >> Go to the next step.

8. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Fuel lines
  - Fuel pump and circuit
  - Fuel pressure regulator
  - Fuel filter for clogging

Is the check result normal?

Yes >> If using the X-431, go to the next step.
If not using the X-431, go to step 10.

No >> Repair or replace the malfunctioning part(s).

9. PERFORM ACTIVE TEST FUNCTION

- Start engine.
- Select ″ACTIVE TEST″ menu.
- Perform injector active test.
- Make sure that each test produces a momentary drop in engine speed.

Is the check result normal?

Yes >> Go to step 14.

No >> Go to the next step.

10. CHECK FUNCTION OF INJECTOR

- Listen to each injector for an operating sound.
- Operating sound should exist.

Is the check result normal?

Yes >> Go to step 14.

No >> Go to the next step.

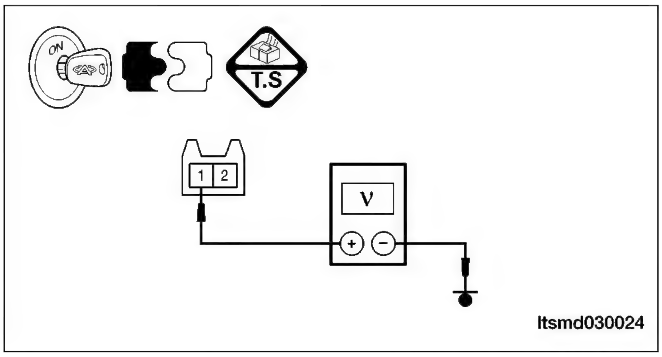
11. CHECK INJECTOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the injector electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



12. CHECK INJECTOR POWER SUPPLY CIRCUIT AND CONTROL CIRCUIT

- Turn ignition switch on.
- Check injector supply voltage between terminal 1 and ground in the injector connector, terminal side.
- Battery voltage should exist.

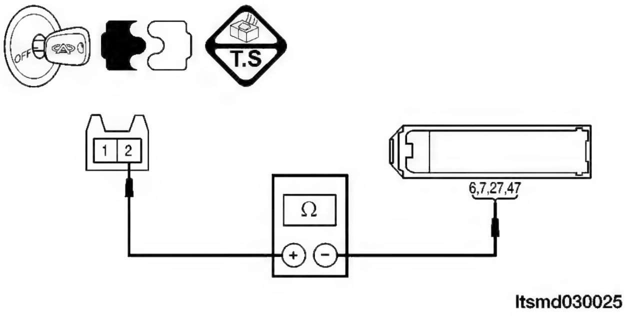
Is the check result normal?

Yes >> Go to step 14.

No >> Go to the next step.

13. CHECK INJECTOR POWER SUPPLY CIRCUIT AND CONTROL CIRCUIT

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check continuity between the following terminals:

<table>
<tr><th colspan="4">FUEL INJECTOR CIRCUIT</th></tr>
<tr><th>INJECTOR NO.</th><th>ECM TERMINAL</th><th>INJECTOR TERMINAL</th><td rowspan="5">
</td></tr>
<tr><td>1</td><td>27</td><td>2</td></tr>
<tr><td>2</td><td>6</td><td>2</td></tr>
<tr><td>3</td><td>7</td><td>2</td></tr>
<tr><td>4</td><td>47</td><td>2</td></tr>
</table>

- Continuity should exist.
- Check harness for a short to power.

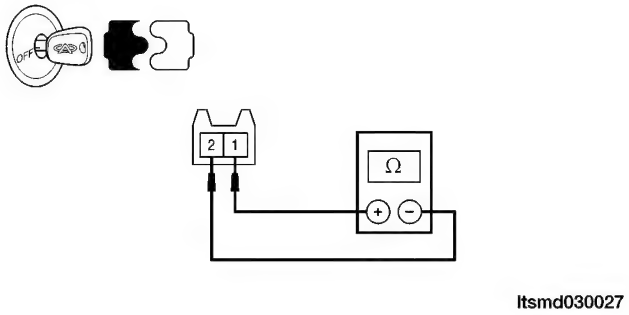
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open, short to power in harness or connectors.

14. CHECK INJECTOR RESISTANCE

- Disconnect the injector harness electrical connectors.
- Check resistance between the following injector terminals, component side:

FUEL INJECTOR RESISTANCE			
INJECTOR NO.	INJECTOR TERMINAL	RESISTANCE (APPROXIMATELY) Ω (20°C)	
1	1 & 2	11 - 16	
2	1 & 2		
3	1 & 2		
4	1 & 2		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace injector.
Go to step 16.

15. CHECK INJECTOR

WARNING!

Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

- Remove fuel delivery rail with injectors (See Fuel Injector Rail Removal & Installation in Section 04 Fuel Delivery).

NOTE :
Be careful not to drop the fuel injectors when removing the fuel delivery rail.

- Keep fuel hose and all injectors connected to injector rail.
- Disconnect all ignition coil electrical connectors.
- Prepare pans or saucers under each injector.
- Crank the engine for approximately 3 seconds.
- Fuel should be sprayed evenly from each injector.

Is the check result normal?

Yes >> Go to the next step.

No >> Clean any injector that sprays unevenly or replace any injector that does not spray fuel.

16. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

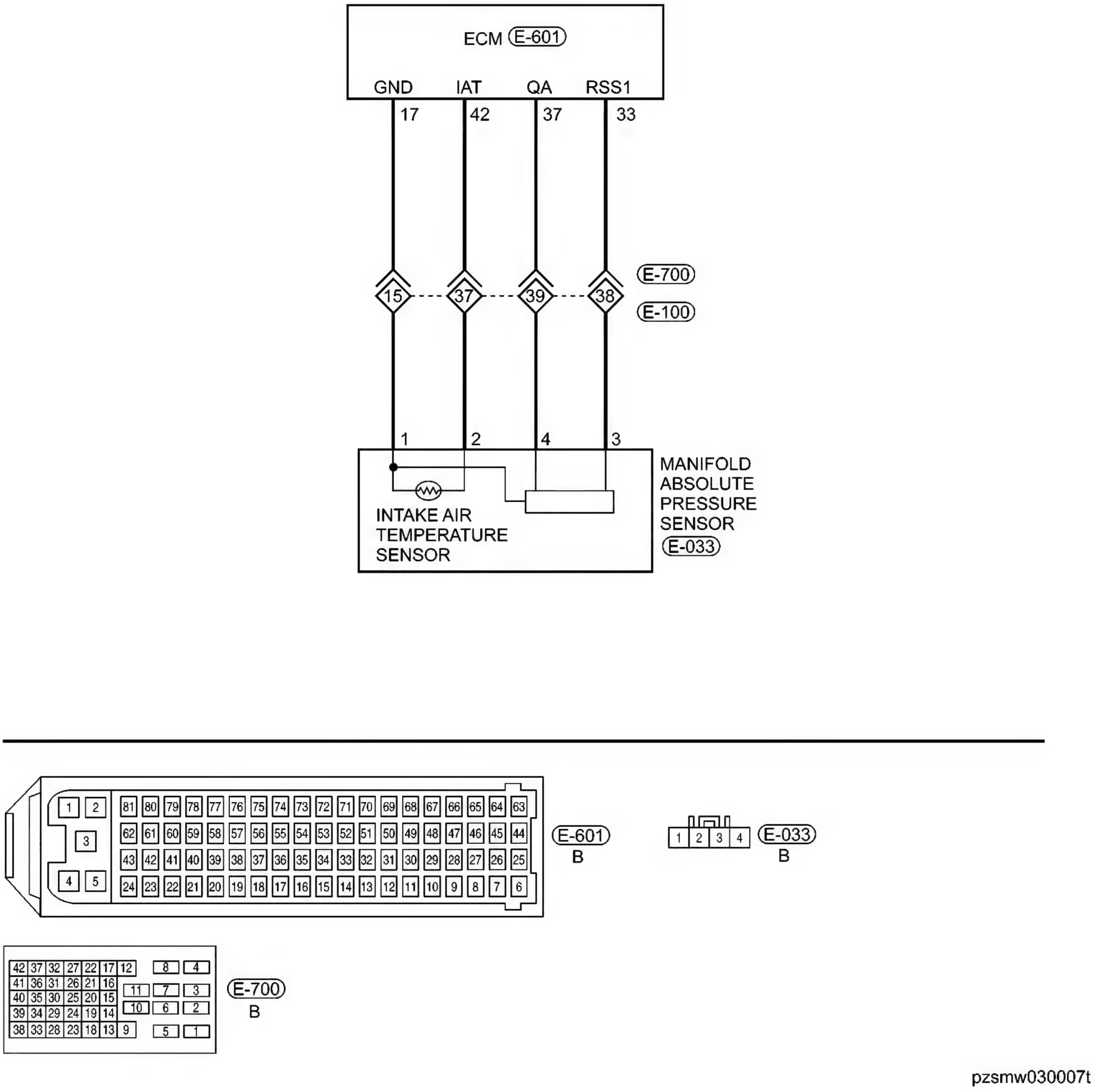
Is DTC P0171 still present?

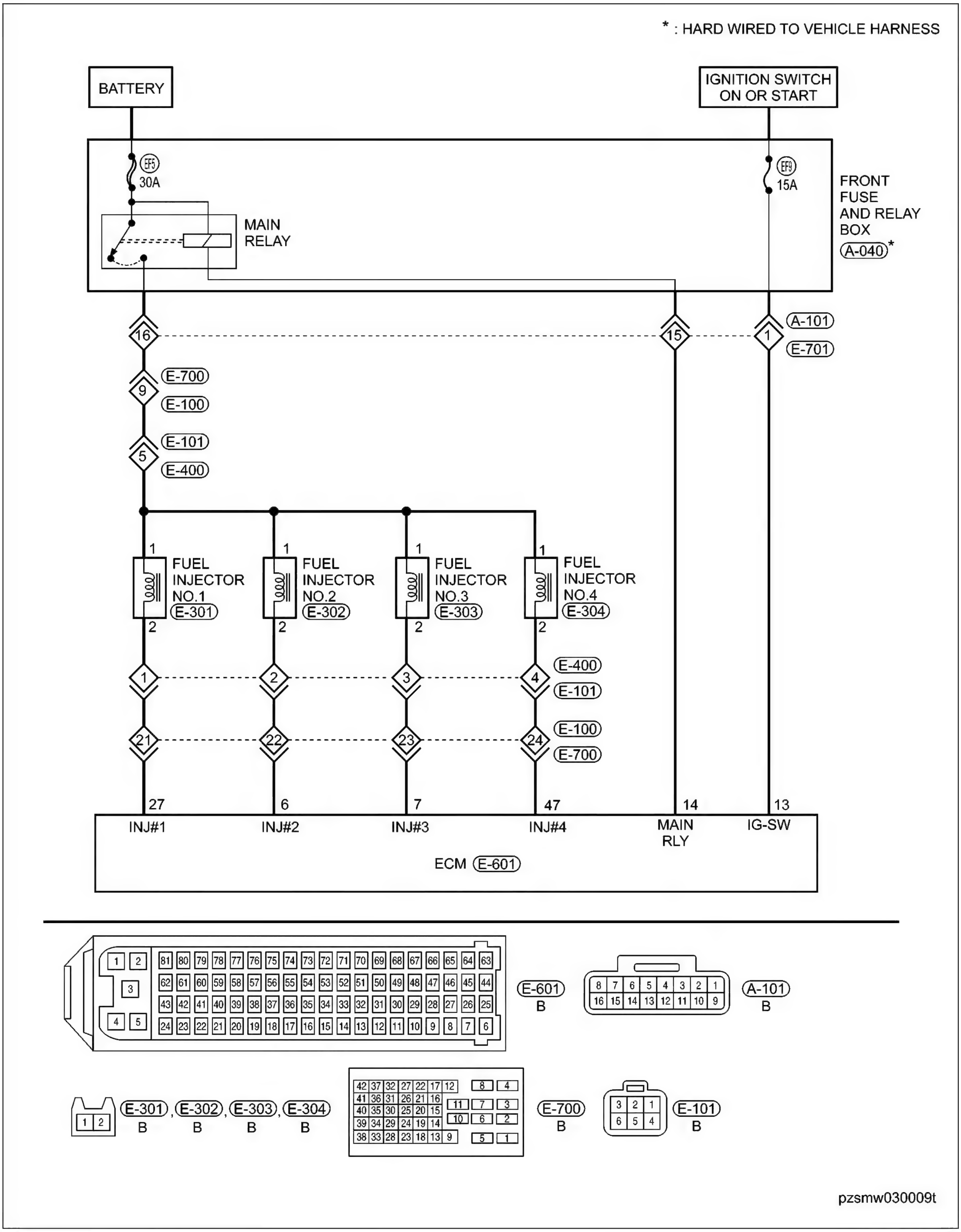
Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0172 - Fuel Trim System Too Rich


ECM E-601
GND
IAT
QA
RSS1
17
42
37
33
15
37
39
38
E-700
E-100
1
2
4
3
MANIFOLD ABSOLUTE PRESSURE SENSOR
E-033
INTAKE AIR TEMPERATURE SENSOR
1 2
3
4 5
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B
1 2 3 4
E-033
B
42 37 32 27 22 17 12 8 4
41 36 31 26 21 16 11 7 3
40 35 30 25 20 15 10 6 2
39 34 29 24 19 14
38 33 28 23 18 13 9 5 1
E-700
B
pzsmw030007t


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5
30A
EF9
15A
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
16
15
1
A-101
E-701
9
E-700
E-100
5
E-101
E-400
FUEL INJECTOR NO.1
E-301
FUEL INJECTOR NO.2
E-302
FUEL INJECTOR NO.3
E-303
FUEL INJECTOR NO.4
E-304
1
2
3
4
E-400
E-101
21
22
23
24
E-100
E-700
27
6
7
47
14
13
INJ#1
INJ#2
INJ#3
INJ#4
MAIN RLY
IG-SW
ECM
E-601
E-601
B
A-101
B
E-301, E-302, E-303, E-304
B
B
B
B
E-700
B
E-101
B
pzsmw030009t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	Engine is running Idle Warm-up condition Accelerate suddenly	Voltage: 11-14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
17	Sensor (GND)	-	0 V
33	Regulated sensor supply 1	Ignition switch: ON	Approximately 5 V
37	Manifold Absolute Pressure (MAP) sensor	Engine running: Idle Press accelerator pedal slowly	Approximately 1.3 V
		Engine running: 2000 RPM	Approximately 1.5 V
		Press accelerator pedal quickly	Up to Approximately 4 V (instantaneous)

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0172	Fuel trim system too rich	Engine is running	The amount of mixture ratio compensation is too large (The mixture ratio is too rich).	• MAP sensor • MAF sensor • Fuel injector • Exhaust gas leaks • Incorrect fuel pressure • Upstream O_2 sensor • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK EXHAUST GAS LEAK

- Start engine and run it at idle.
- Listen for any exhaust gas leaks before the three way catalyst.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair the leak as necessary.

2. CHECK ECM CONTROL SIGNAL IN DATA STREAM

- With X-431, select view data stream and reference the following data:

INJECTOR REFERENCE DATA			
MONITOR ITEM	**CONDITION**		**DATA**
Injector pulse	Engine Temp: Warm-up 78°C Transaxle Position: N Air Conditioner: Off Engine load: No load	Idle	Approximately 2.5 ms

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.

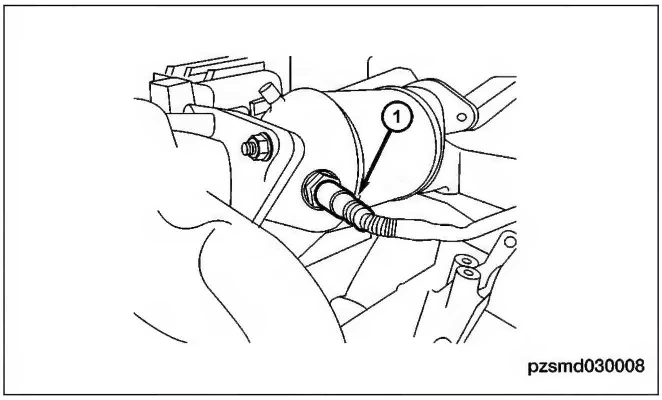
3. CHECK UPSTREAM O_2 SENSOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the upstream O_2 sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



4. CHECK UPSTREAM O_2 SENSOR SIGNAL CIRCUIT

- Disconnect the ECM electrical connector.
- Check continuity between the following terminals:

O_2 SENSOR CIRCUIT		
COMPONENT	**ECM**	**O_2 SENSOR**
TERMINAL	36	3
	18	4

- Continuity should exist.
- Check harness for short to power.

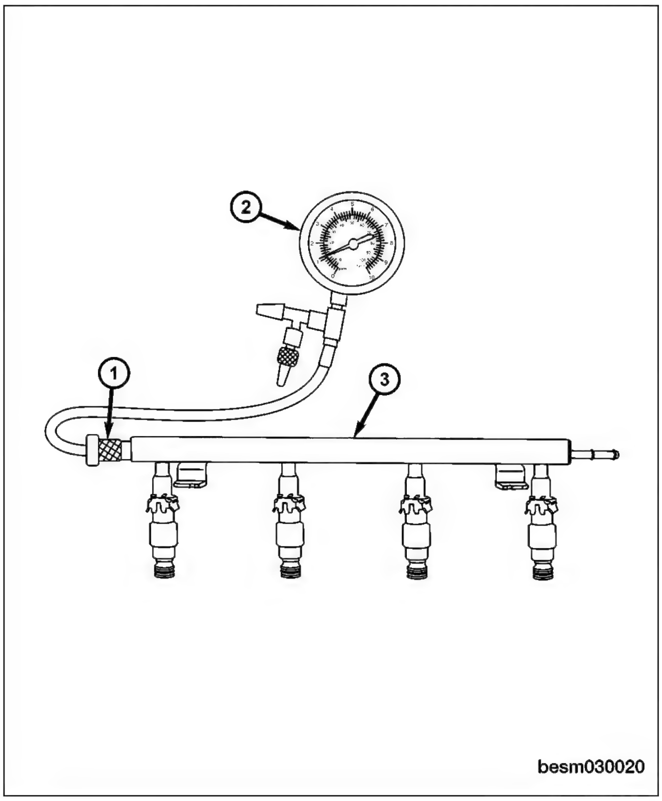
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open or short to power in harness or connectors.

5. CHECK FUEL PRESSURE

- Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
- Install fuel pressure gauge (2) and check the fuel pressure (See Fuel Pressure Test in Section 04 Fuel Delivery).



- Observe the following fuel pressures when testing:

FUEL PRESSURES	
Key On	400 kPa (4.0 bar)
Key Off	380 kPa (3.8 bar) in 10 minutes
Engine Idle	400 - 420 kPa (4.0 - 4.2 bar)

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.

6. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Fuel pump and circuit
  - Fuel pressure regulator

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace as necessary.

7. CHECK THE MAP OR MAF SENSOR SIGNAL

- Turn ignition switch off.
- Install all previously removed parts.
- Check MAP signal and reference the following data:

MAP DATA				
ECM TERMINAL NO.	**ITEM**	**CONDITION**		**DATA (DC VOLTAGE)**
37	Manifold Absolute Pressure (MAP) sensor	Engine: Running	Engine running: Idle Press accelerator pedal slowly	Approximately 1.3 V
			Engine running: 2000 RPM	Approximately 1.5 V
			Press accelerator pedal quickly	Up to Approximately 4 V (instantaneous)

Is the check result normal?

Yes >> If using the X-431, go to the next step.
If not using the X-431, go to step 9.

No >> Check connectors for damaged or MAP signal circuit for short to power circuit.

8. PERFORM ACTIVE TEST FUNCTION

- Start engine.
- Select ″ACTIVE TEST″ menu.
- Perform injector active test.
- Make sure that each test produces a momentary drop in engine speed.

Is the check result normal?

Yes >> Go to step 12.

No >> Go to the next step.

9. CHECK FUNCTION OF INJECTOR

- Listen to each injector for operating sound.
- Operating sound should exist.

Is the check result normal?

Yes >> Go to step 13.

No >> Go to the next step.

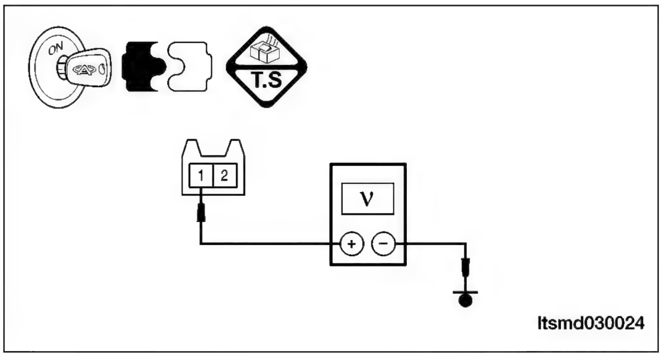
10. CHECK INJECTOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the injector electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

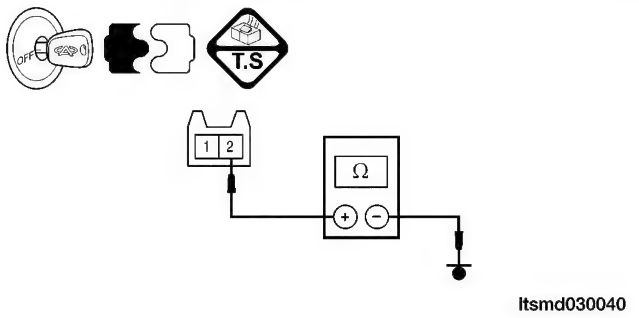
Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



11. CHECK INJECTOR CONTROL CIRCUIT

- Disconnect the ECM electrical connector.
- Check harness for short to ground between the following terminals:

<table>
<tr><th colspan="4">FUEL INJECTOR CIRCUITS</th></tr>
<tr><th>INJECTOR NO.</th><th>ECM TERMINAL</th><th>INJECTOR TERMINAL</th><td rowspan="5">
</td></tr>
<tr><td>1</td><td>27</td><td>2</td></tr>
<tr><td>2</td><td>6</td><td>2</td></tr>
<tr><td>3</td><td>7</td><td>2</td></tr>
<tr><td>4</td><td>47</td><td>2</td></tr>
</table>

- Continuity should not exist.

Is the check result normal?

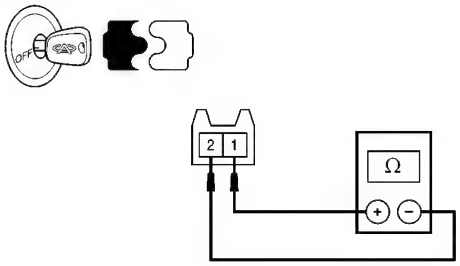
Yes >> Go to the next step.

No >> Repair circuit for a short to ground in harness or connectors.

12. CHECK INJECTOR RESISTANCE

- Disconnect the injector harness connectors.
- Check resistance between the following injector terminals, component side:

FUEL INJECTOR RESISTANCE

INJECTOR NO.	INJECTOR TERMINAL	RESISTANCE (APPROXIMATELY) Ω (20°C)	
1	1 & 2	11 - 16	 Itsmd030027
2	1 & 2		
3	1 & 2		
4	1 & 2		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace injector.
Go to step 14.

13. CHECK INJECTORS

WARNING!

Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

- Remove fuel delivery rail with injectors (See Fuel Injector Rail Removal & Installation in Section 04 Fuel Delivery).

NOTE :
Be careful not to drop the fuel injectors when removing the fuel delivery rail.

- Keep fuel hose and all injectors connected to injector rail.
- Disconnect all injector harness connectors.
- Disconnect all ignition coil harness connectors.
- Prepare pans or saucers under each injector.
- Crank the engine for approximately 3 seconds.
- Make sure fuel does not drip from injectors.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace any injectors from which fuel is dripping. Always replace fuel injector O-rings when replacing the fuel injector(s).

14. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

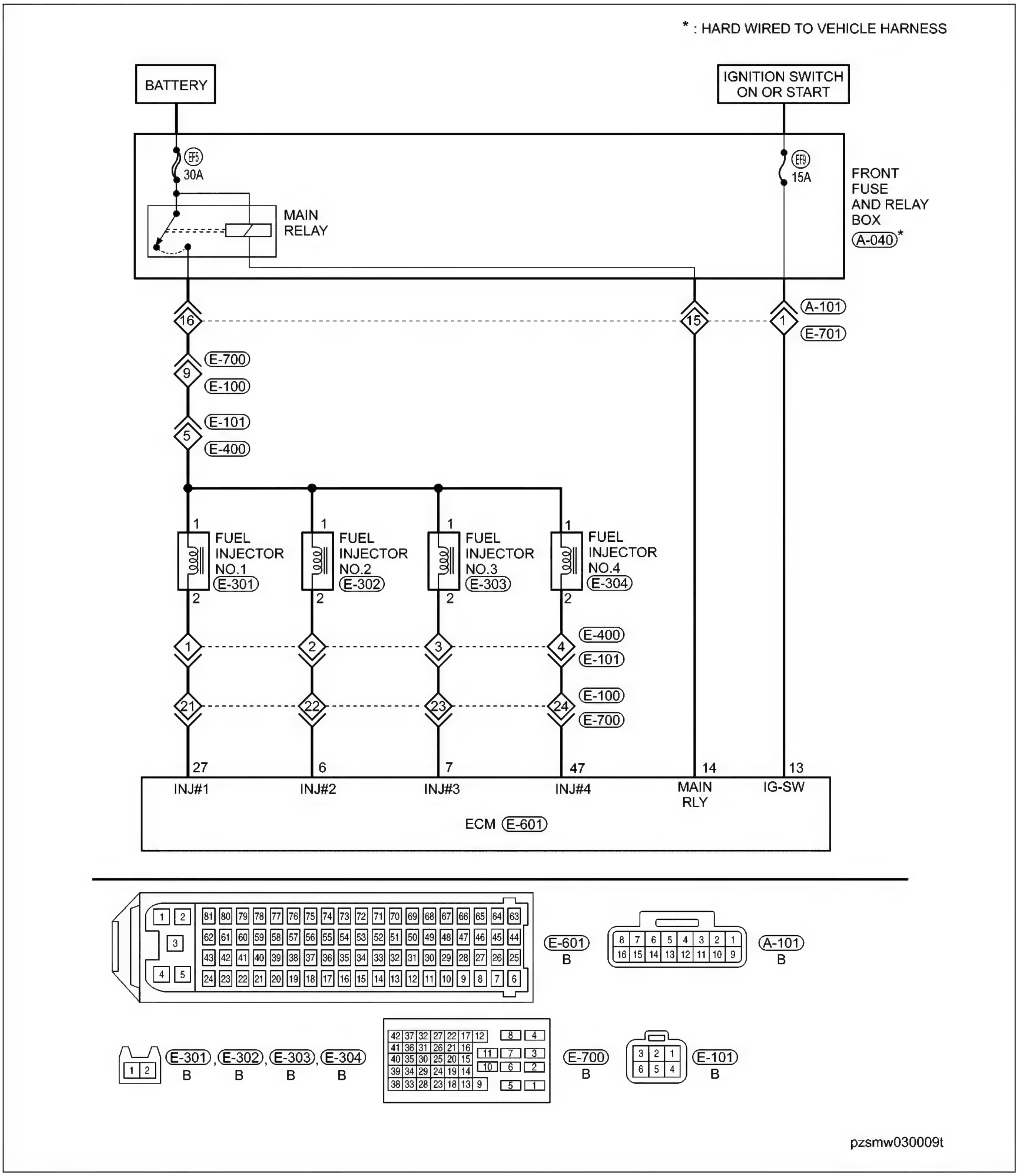
Is DTC P0172 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0201 - Cylinder 1 - Injector Circuit
P0202 - Cylinder 2 - Injector Circuit
P0203 - Cylinder 3 - Injector Circuit
P0204 - Cylinder 4 - Injector Circuit


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5
30A
EF9
15A
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
16
15
1
A-101
E-701
9
E-700
E-100
5
E-101
E-400
1
FUEL INJECTOR NO.1
E-301
FUEL INJECTOR NO.2
E-302
FUEL INJECTOR NO.3
E-303
FUEL INJECTOR NO.4
E-304
2
1
2
3
4
E-400
E-101
21
22
23
24
E-100
E-700
27
6
7
47
14
13
INJ#1
INJ#2
INJ#3
INJ#4
MAIN RLY
IG-SW
ECM E-601
E-601
B
A-101
B
E-301, E-302, E-303, E-304
B B B B
E-700
B
E-101
B
pzsmw030009t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
6	Injector 2	Engine is running Warm-up condition Idle Accelerate suddenly	Voltage: 11 - 14 V
7	Injector 3		
27	Injector 1		
47	Injector 4		

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0201	Cylinder 1 - Injector Circuit	Engine is running	• Injector • Harness or connectors • ECM
P0202	Cylinder 2 - Injector Circuit		
P0203	Cylinder 3 - Injector Circuit		
P0204	Cylinder 4 - Injector Circuit		

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. PRELIMINARY INSPECTION

- Attempt to start the engine.

Is any cylinder firing?

Yes >> If using the X-431, go to the next step.
If not using the X-431, go to step 4.

No >> Go to step 5.

3. PERFORM ACTIVE TEST FUNCTION

- Start engine.
- Select "ACTIVE TEST" menu.
- Perform injector active test.
- Make sure that each test produces a momentary drop in engine speed.

Is the check result normal?

Yes >> Go to step 10.

No >> Go to step 5.

4. CHECK FUNCTION OF INJECTOR

- Listen to each injector for operating sound.
- Operating sound should exist.

Is the check result normal?

Yes >> Go to step 10.

No >> Go to the next step.

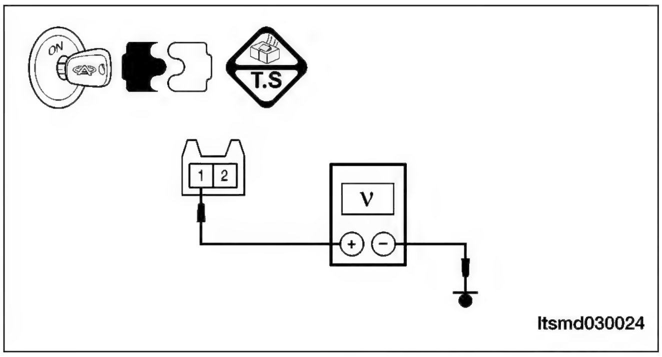
5. CHECK INJECTOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the injector electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



6. CHECK INJECTOR POWER SUPPLY CIRCUIT FOR OPEN OR SHORT

- Turn ignition switch on.
- Check injector supply voltage between terminal 1 and ground, terminal side.
- Battery voltage should exist.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.

7. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Fuse EF5
  - Main relay
  - Front fuse and relay box A-040
  - Harness for an open or short to ground between injector and fuse

Is the check result normal?

Yes >> With X-431, check the system, If OK, go to the next step.

No >> Repair or replace malfunctioning part(s).

8. CHECK INJECTOR CONTROL CIRCUITS FOR OPEN

- Check injector control circuit voltage.
- 3.6 V should exist.

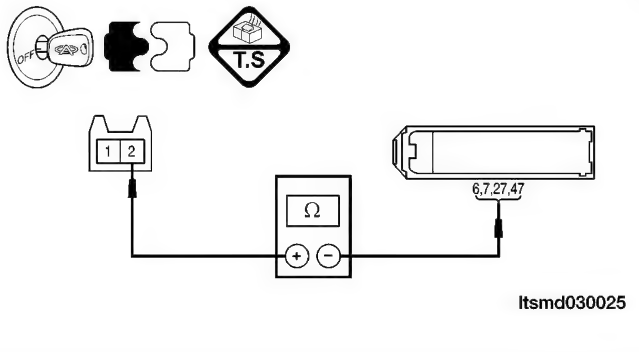
Is the check result normal?

Yes >> Go to step 10.

No >> Go to the next step.

9. DETECT MALFUNCTIONING PART

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check the continuity between the following terminals:

CHECK INJECTOR CIRCUIT			
INJECTOR NO	ECM TERMINAL	INJECTOR TERMINAL	
1	27	2	
2	6	2	
3	7	2	
4	47	2	

- Continuity should exist.

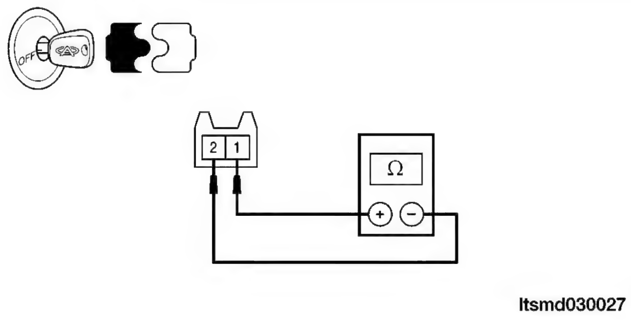
Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open in harness or connectors.

10. CHECK INJECTOR

- Check resistance between the following injector terminals, component side:

FUEL INJECTOR RESISTANCE			
INJECTOR NO.	**INJECTOR TERMINAL**	**RESISTANCE (APPROXIMATELY) Ω (20°C)**	
1	1 & 2	11 - 16	
2	1 & 2		
3	1 & 2		
4	1 & 2		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace injector.

11. CHECK INJECTOR OPERATION

- Connect the ECM electrical connector.
- Connect injector connector.
- Check injector voltage under the following conditions:

INJECTOR REFERENCE DATA			
TERMINAL NO.	**INJECTOR NO**	**CONDITION**	**DATA (AVERAGE DC VOLTAGE)**
6	2	• Engine is running • Warm-up condition • Idle • Accelerate suddenly	Voltage: 11 - 14 V
7	3		
27	1		
47	4		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace injector.

12. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

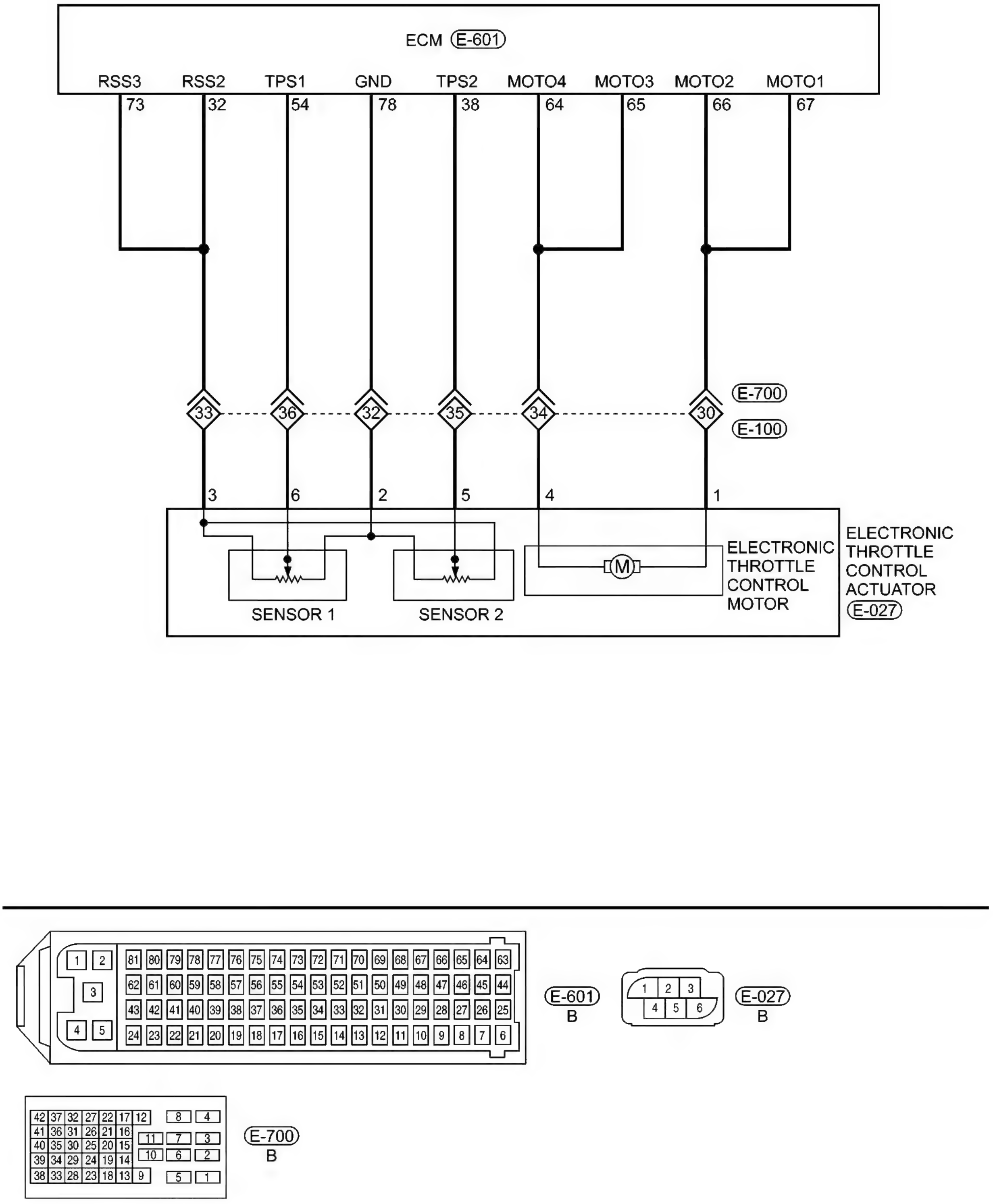
Is DTC P0201, P0202, P0203 or P0204 still present?

Yes >> Replace the ECM.

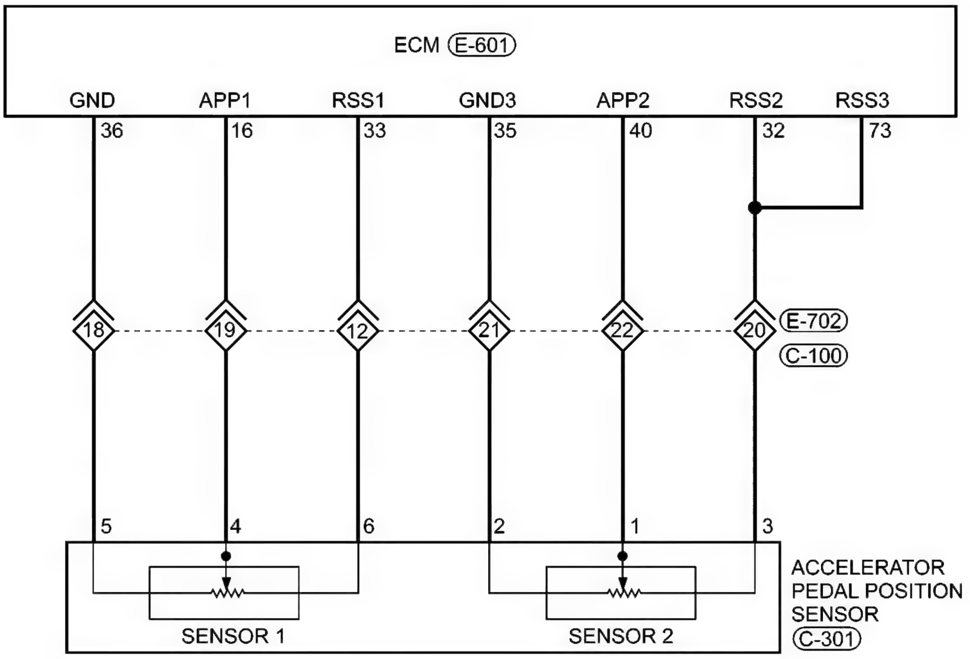
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

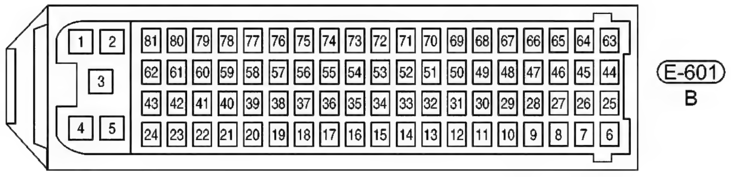
No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

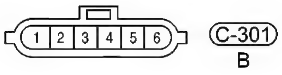
P0221 - Throttle Position Sensor B Performance

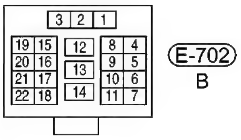

ECM E-601
RSS3
RSS2
TPS1
GND
TPS2
MOTO4
MOTO3
MOTO2
MOTO1
73
32
54
78
38
64
65
66
67
33
36
32
35
34
30
E-700
E-100
3
6
2
5
4
1
SENSOR 1
SENSOR 2
M
ELECTRONIC THROTTLE CONTROL MOTOR
ELECTRONIC THROTTLE CONTROL ACTUATOR E-027
1 2
3
4 5
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601 B
1 2 3
4 5 6
E-027 B
42 37 32 27 22 17 12
41 36 31 26 21 16
40 35 30 25 20 15
39 34 29 24 19 14
38 33 28 23 18 13 9
8 4
11 7 3
10 6 2
5 1
E-700 B

pzsmw030003t


ECM E-601
GND
APP1
RSS1
GND3
APP2
RSS2
RSS3
36
16
33
35
40
32
73
18
19
12
21
22
20
E-702
C-100
5
4
6
2
1
3
SENSOR 1
SENSOR 2
ACCELERATOR PEDAL POSITION SENSOR
C-301


1 2
3
4 5
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B


1 2 3 4 5 6
C-301
B


3 2 1
19 15
20 16
21 17
22 18
12
13
14
8 4
9 5
10 6
11 7
E-702
B

pzsmw030008t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
32	Regulated sensor supply 2	Ignition switch: ON	-	Approximately 5 V
38	Electronic throttle control actuator (position sensor)		Engine: Stopped Accelerator pedal: Fully released	4.24 V
			Engine: Stopped Accelerator pedal: Fully depressed	0.72 V
54	Electronic throttle control actuator		Engine: Stopped Accelerator pedal: Fully released	0.74 V
			Engine: Stopped Accelerator pedal: Fully depressed	4.62 V
64	Electronic throttle control actuator		-	0 V or 12 V
65	Electronic throttle control actuator			
66	Electronic throttle control actuator			12 V or 0 V
67	Electronic throttle control actuator			
73	Regulated sensor supply 3			Approximately 5 V
78	Sensor (GND)			Approximately 0 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0221	Throttle Position Sensor (TPS) B performance	Ignition switch on or after engine start	Rationally incorrect voltage is sent to ECM compared with the signals from TPS1 and TPS2.	• Electronic throttle control actuator (TPS1 and TPS2) • Harness or connectors • Accelerator pedal position sensor 2 • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.

- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

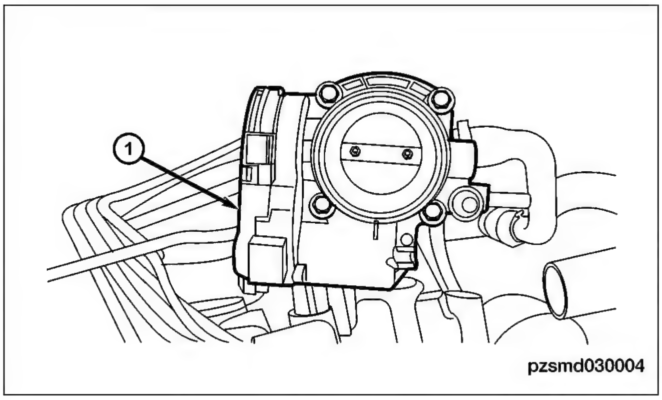
2. CHECK TPS ELECTRICAL CONNECTOR

- Disconnect the TPS (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



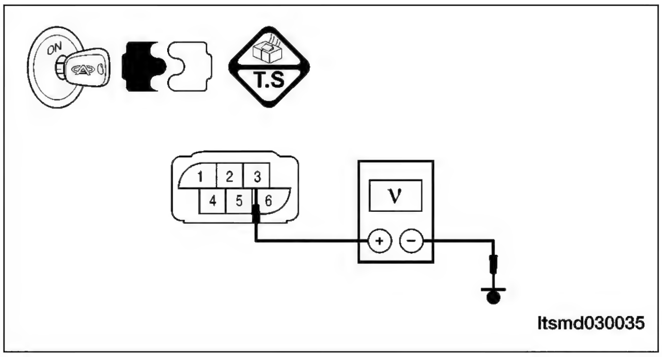
3. CHECK THE TPS POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check voltage between TPS terminal 3 and ground in connector E-027, terminal side.
- Approximately 5 V should exist.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.



4. CHECK TPS POWER SUPPLY CIRCUIT

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check the continuity between TPS terminal 3 and ECM terminal 32.
- Check the continuity between TPS terminal 3 and ECM terminal 73.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open.
If the circuit is normal, go to the next step.

5. CHECK TPS POWER SUPPLY CIRCUIT

- Check harness for short to power and short to ground, between the following terminals:

TPS POWER SUPPLY	
ECM TERMINAL	**TPS / APPS TERMINAL**
32 or 73	TPS terminal 3
32 or 73	APP sensor terminal 3
33	APP sensor terminal 6

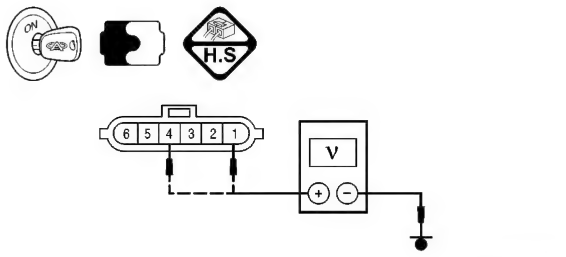
Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for a short to ground or short to power in harness or connectors.

6. CHECK THE APP SENSOR

- Connect all harness connectors that have been disconnected.
- Turn ignition switch on.
- Check voltage between ECM terminal 16 (APP sensor 1) and ground, and ECM terminal 40 (APP sensor 2) and ground harness side, under the following conditions:

APP SENSOR SIGNAL						
ECM TERMINAL NO.	**APP SENSOR TERMINAL**	**ITEM**	**CONDITION**		**DATA (DC VOLTAGE)**	
16	APP sensor terminal 4	Accelerator Pedal Position Sensor	Ignition switch: ON	Engine stopped Accelerator pedal: Fully released	0.72 - 0.74 V	 ltsmd030037
				Engine stopped Accelerator pedal: Fully depressed	3.95 V	
40	APP sensor terminal 1	Accelerator Pedal Position Sensor		Engine stopped Accelerator pedal: Fully released	0.36 - 0.37 V	
				Engine stopped Accelerator pedal: Fully depressed	1.97 V	

Is the check result normal?

Yes >> Go to step 11.

No >> Replace the Accelerator Pedal Assembly (See Accelerator Pedal Position Sensor Removal & Installation in Section 03 Electronic Engine Controls).
Perform accelerator pedal position learning.
Perform throttle valve position learning.

7. CHECK THE TPS SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check continuity between the electronic throttle control actuator terminal 5 and ECM terminal 38.
- Continuity should exist.
- Check harness for a short to power and short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open, short to power or short to ground in harness or connectors.

8. CHECK TPS GROUND CIRCUIT FOR AN OPEN

- Check continuity between the electronic throttle control actuator terminal 2 and ECM terminal 78.
- Continuity should exist.
- Check harness for short to power.

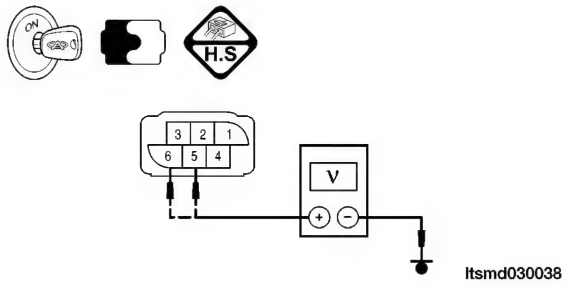
Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short to power in harness or connectors.

9. CHECK TPS

- Connect all harness connectors that have been disconnected.
- Turn ignition switch on.
- Check voltage between TPS terminals 6 (TPS1) and ground, terminal 5 (TPS2) and ground under the following conditions:

TPS TERMINAL					
TPS TERMINAL NO.	**ITEM**	**CONDITION**		**VOLTAGE (DC VOLTAGE)**	
5	Throttle Position Sensor 2 (TPS2)	Ignition switch: ON	Engine stopped Accelerator pedal: Fully released	4.24 V	 ltsmd030038
			Engine stopped Accelerator pedal: Fully depressed	0.72 V	
6	Throttle Position Sensor 1 (TPS1)		Engine stopped Accelerator pedal: Fully released	0.74 V	
			Engine stopped Accelerator pedal: Fully depressed	4.62 V	

Is the check result normal?

Yes >> Go to the next step.

No >> Replace electronic throttle control actuator, and perform throttle valve position learning.

10. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to "DTC Confirmation Procedure".

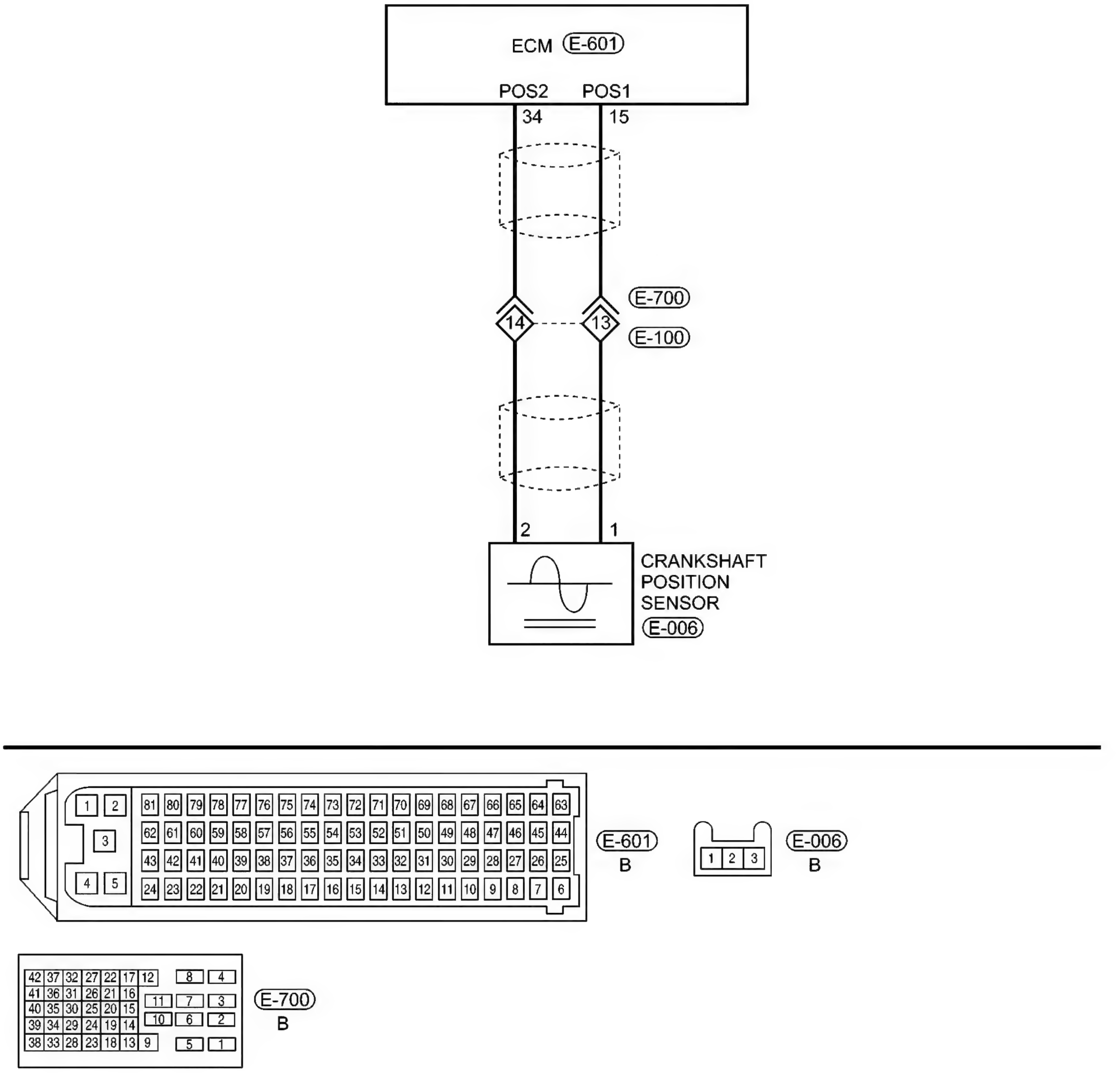
Is DTC P0221 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0321 - Distributor Engine Speed In-Phase Circuit Performance


ECM
E-601
POS2
POS1
34
15
E-700
14
13
E-100
2
1
CRANKSHAFT
POSITION
SENSOR
E-006
E-601
B
E-006
B
E-700
B

pzsmw030004t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
15	Crankshaft Position (CKP) sensor	Ignition switch: ON Engine: Not cranking	3 V
34			

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0321	Distributor engine speed in-phase circuit performance	Engine is running	ECM detected that the input signal is out of the acceptable range.	• CKP sensor • Crankshaft signal plate • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

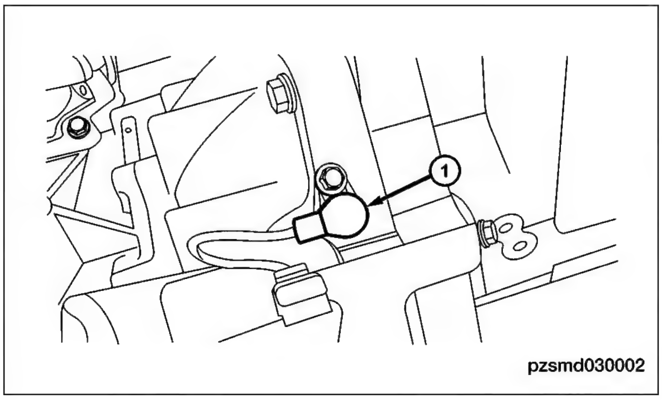
2. CHECK CKP SENSOR ELECTRICAL CONNECTOR

- Disconnect the CKP sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



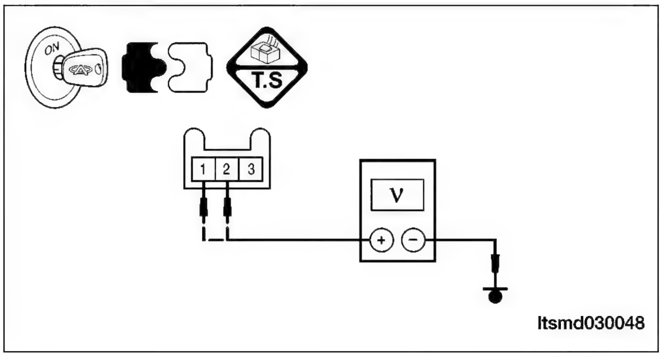
3. CHECK THE CKP SENSOR REFERENCE VOLTAGE CIRCUIT

- Turn ignition switch on.
- Check voltage between CKP sensor terminal 1 and ground in connector E-006, terminal side.
- Check voltage between CKP sensor terminal 2 and ground in connector E-006, terminal side.
- Approximately 3 V should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



4. DETECT MALFUNCTIONING PART

- Check the harness for an open or short between CKP sensor and ECM.

Is the check result normal?

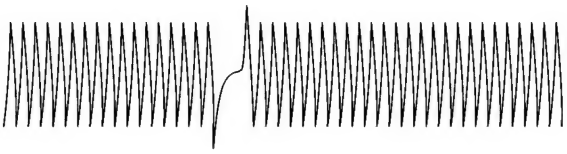
Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair or replace the circuit for an open or short in harness or connectors.

5. CHECK CKP SENSOR SIGNAL

- Connect the ECM electrical connector.
- Connect CKP sensor electrical connector.
- Check sensor output signal while the engine is running.

CKP SENSOR OUTPUT SIGNAL	
	CKP SENSOR SIGNAL
WITH ENGINE ANALYZER (KES-200)	

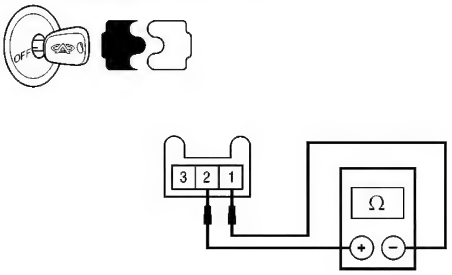
Is the CKP output signal normal?

Yes >> Go to step 9.

No >> Go to the next step.

6. CHECK CKP SENSOR

- Check the sensor as follows:
  - Remove the sensor mounting bolt.
  - Remove the sensor.
  - Visually check the sensor for any damage.
- Check resistance between the following CKP sensor terminals, component side:

CKP SENSOR RESISTANCE		
TERMINAL NO.	**RESISTANCE (APPROXIMATELY) Ω (20°C)**	
1 & 2	Approximately 860 Ω	

Is the check result normal?

Yes >> Replace the CKP sensor with a known good CKP sensor.
Monitor the CKP sensor signal on the KES-200 screen.
– If the CKP sensor signals were normal, the system is OK.
– If the CKP sensor signals were still irregular or missing, go to step 7.

No >> Replace or clean the CKP sensor.

7. CHECK CKP SENSOR INSTALLED CLEARANCE

- Check the installed clearance (See Crankshaft Position Sensor Removal & Installation in Section 03 Electronic Engine Controls).

NOTE :
0.8 - 1.2 mm gap should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Reinstall CKP sensor.

8. CHECK GEAR TEETH

- Visually check for any chipped signal plate gear teeth.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the signal plate.

9. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

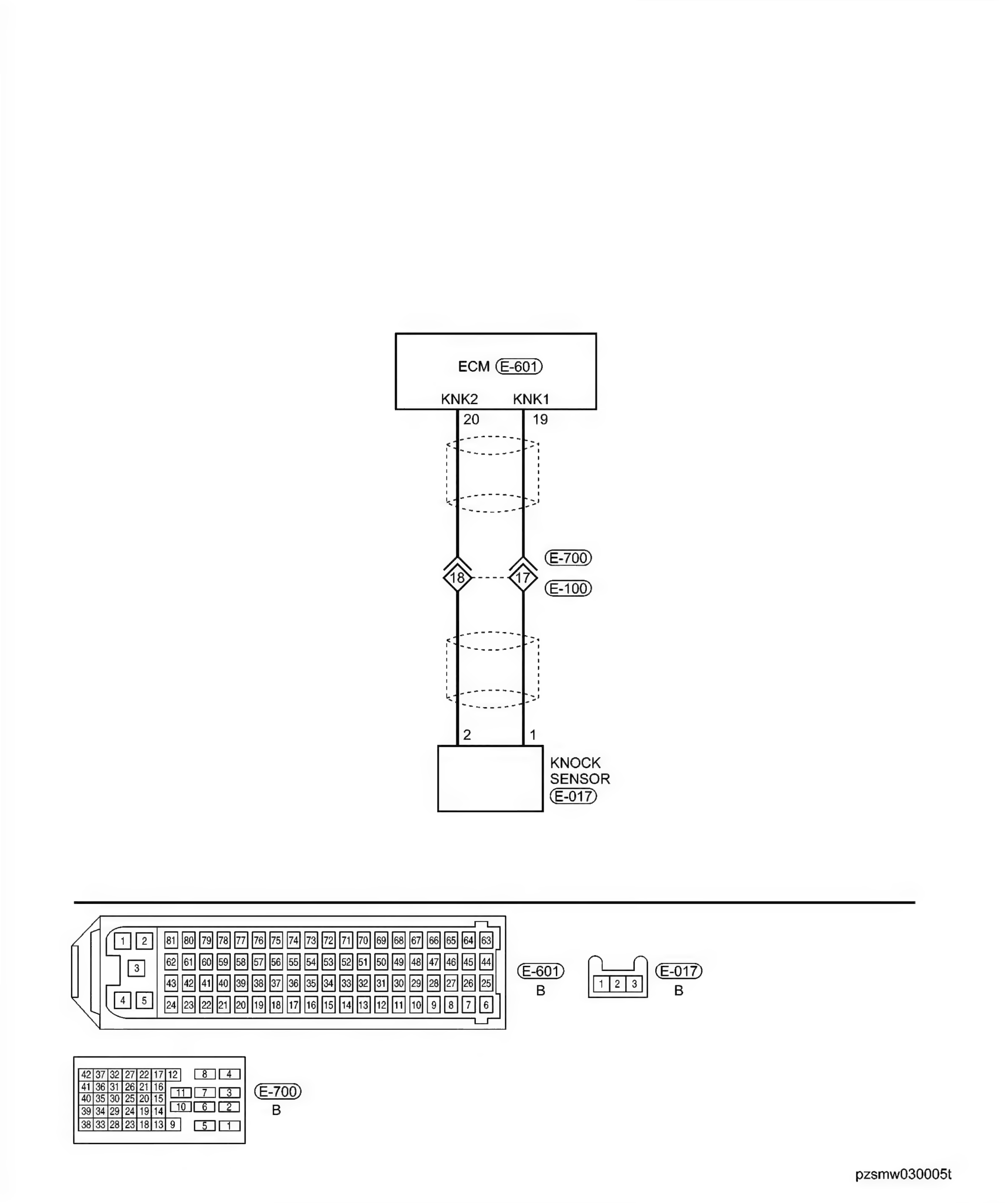
Is DTC P0321 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0324 - Knock Control System Error
P0327 - Knock Sensor 1 Circuit Low Input
P0328 - Knock Sensor 1 Circuit High Input


ECM E-601
KNK2
KNK1
20
19
E-700
18
17
E-100
2
1
KNOCK SENSOR E-017
1 2 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
3 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B
1 2 3
E-017
B
42 37 32 27 22 17 12 8 4
41 36 31 26 21 16 11 7 3
40 35 30 25 20 15 10 6 2
39 34 29 24 19 14
38 33 28 23 18 13 9 5 1
E-700
B
pzsmw030005t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
19	Knock sensor 1	Test Method 1: Knock at cylinder with rubber hammer Test Method 2: Knock at sensor slightly	Output signal voltage should exist.
20	Knock sensor 2		

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC SET CONDITION	POSSIBLE CAUSE
P0324	Knock control system error	ECM detected that the input signal is out of the acceptable range.	• Knock sensor • Harness or connectors • ECM
P0327	Knock sensor 1 circuit low input	ECM detected that the input signal is low condition.	
P0328	Knock sensor 1 circuit high input	ECM detected that the input signal is high condition.	

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

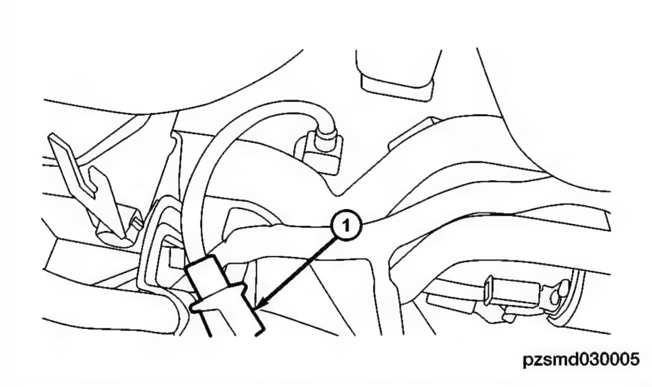
- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground connections.

2. CHECK KNOCK SENSOR ELECTRICAL CONNECTOR



pzsmd030005

- Disconnect the knock sensor (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

3. CHECK THE KNOCK SENSOR RESISTANCE

- Check the resistance between knock sensor connector E-017, terminal 1 and terminal 2.
- The resistance should be above 1 MΩ.

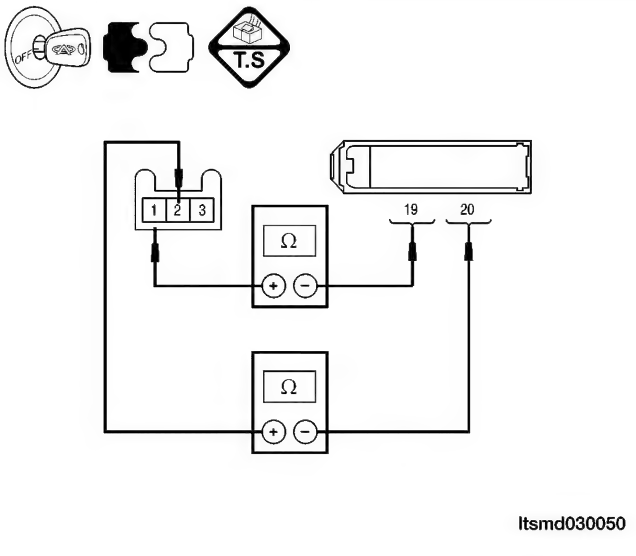
Is the check result normal?

Yes >> Go to the next step.

No >> Replace the knock sensor.

4. CHECK THE KNOCK SENSOR OUTPUT SIGNAL CIRCUIT

- Disconnect the ECM electrical connector.
- Check the knock sensor circuit resistance as shown in the following table:

KNOCK SENSOR CIRCUIT		
ECM TERMINAL	KNOCK SENSOR TERMINAL	 ltsmd030050
19	1	
20	2	

- Continuity should exist.
- Check harness for a short to ground and short to power.

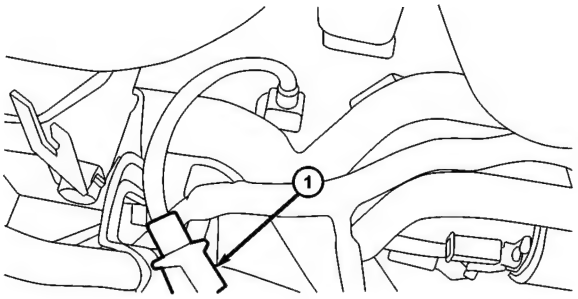
Is the check result normal?

Yes >> Go to step 5.

No >> Repair or replace the circuit for an open or short in harness or connectors.

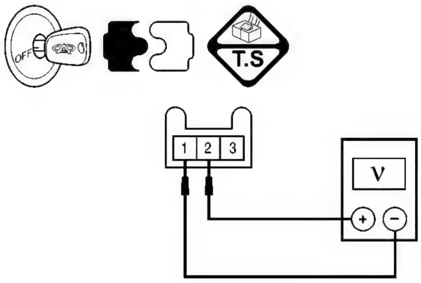
5. CHECK KNOCK SENSOR SIGNAL

- Check knock sensor output signal in connector (1).
- Set digital multimeter on voltage range.



pzsmd030005

- Using the test methods below, test the knock sensor circuit as follows:

KNOCK SENSOR OUTPUT SIGNAL		
KNOCK SENSOR TERMINAL NO.	**TEST METHOD**	 ltsmd030051
1 - 2	• Method 1: Knock at cylinder with rubber hammer	
	• Method 2: Knock at sensor slightly	

- Output signal voltage should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the knock sensor.

6. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

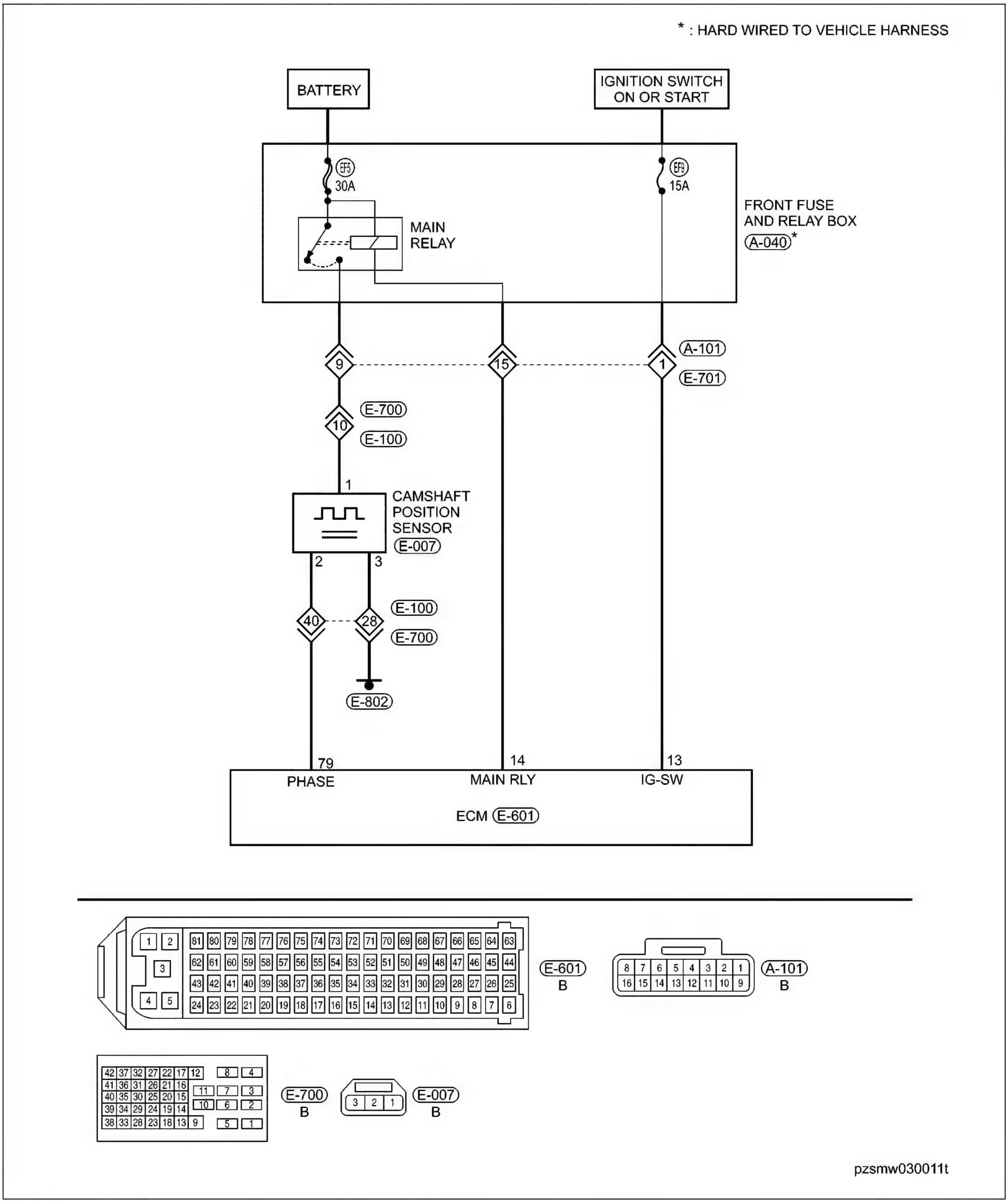
Is DTC P0324, P0327 or P0328 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0340 - Camshaft Position Sensor Circuit
P0341 - Camshaft Position Sensor Performance
P0342 - Camshaft Position Sensor Circuit Low Input
P0343 - Camshaft Position Sensor Circuit High Input


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5 30A
EF9 15A
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
9
15
1
A-101
E-701
10
E-700
E-100
1
CAMSHAFT POSITION SENSOR
E-007
2
3
40
28
E-100
E-700
E-802
79
PHASE
14
MAIN RLY
13
IG-SW
ECM E-601
E-601 B
A-101 B
E-700 B
E-007 B
pzsmw030011t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
79	Camshaft Position (CMP) sensor	Ignition switch: ON Engine: Not cranking	11 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0340	Camshaft Position (CMP) sensor circuit	Engine is running	ECM detected that the input signal is out of the acceptable range.	• CMP sensor • Camshaft • Harness or connectors (The sensor circuit is open or shorted) • ECM
P0341	Camshaft Position (CMP) sensor performance			
P0342	Camshaft Position (CMP) sensor circuit low input			
P0343	Camshaft Position (CMP) sensor circuit high input			

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

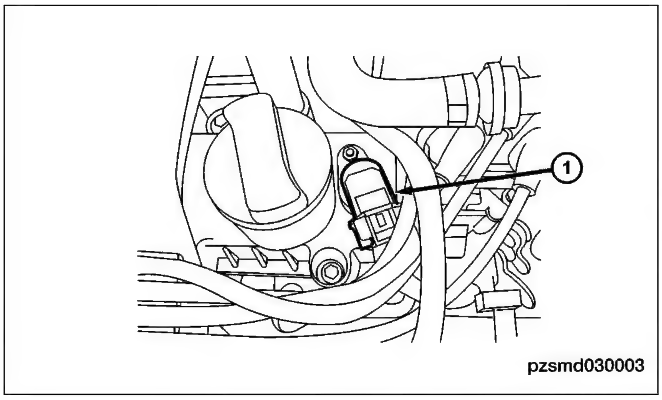
- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. CHECK CMP SENSOR ELECTRICAL CONNECTOR



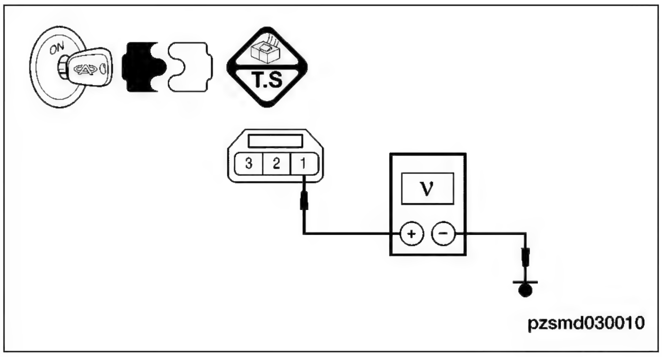
- Disconnect the CMP sensor electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

3. CHECK CMP SENSOR POWER SUPPLY CIRCUIT FOR OPEN OR SHORT



- Turn ignition switch on.
- Check CMP sensor supply voltage between connector E-007 terminal 1 and ground, terminal side.
- 12 V should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.

4. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Fuse EF5
  - Main relay
  - Front fuse and relay box A-040
  - Harness for open or short between CMP sensor terminal 1 and fuse EF5
  - Harness for open or short between ECM terminal 14 and fuse EF5

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the malfunctioning part(s).

5. CHECK CMP SENSOR GROUND CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Check continuity between CMP sensor terminal 3 and ground.
- Continuity should exist.
- Check harness for short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or short to power in harness or connectors.

6. CHECK CMP SENSOR INPUT SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch on.
- Check voltage between CMP sensor terminal 2 and ground.
- 10 V should exist.

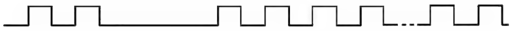
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the open circuit or short to power or short to ground in harness or connectors. If circuit is normal, go to the next step.

7. CHECK CMP SENSOR SIGNAL

- Connect CMP sensor electrical connector.
- Check signal voltage between CMP sensor terminal 2 and ground when engine is running.
- Approximately 6 V square wave signal should exist.

CKP SENSOR SIGNAL	
	CMP SENSOR SIGNAL
WITH ENGINE ANALYZER (KES-200)	 vismd030003

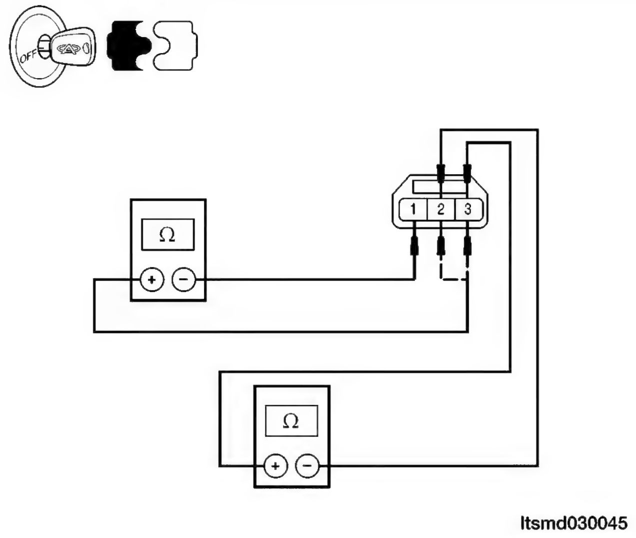
Is the CMP output signal normal?

Yes >> Go to step 10.

No >> Go to the next step.

8. CHECK CKP SENSOR

- Check the sensor as follows:
  - Remove the sensor mounting bolt.
  - Remove the sensor.
  - Visually check the sensor for any damage.
- Check resistance between the following CKP sensor terminals, component side:

CKP SENSOR RESISTANCE		
TERMINAL NO.	**RESISTANCE Ω (25°C)**	 OFF Ω + − 1 2 3 Ω + − ltsmd030045
1 & 2	Except 0 or ∞	
1 & 3		
2 & 3		

Is the check result normal?

Yes >> Replace the CMP sensor with a known good CMP sensor.
Monitor the CMP sensor signal on the KES-200 screen.
– If the CMP sensor signals are normal, the system is OK.
– If the CMP sensor signals are still irregular or missing, go to step 9.

No >> Replace CMP sensor.

9. CHECK THE CMP SENSOR INSTALLED CLEARANCE

- Check the installed clearance (See Camshaft Position (CMP) Sensor Removal & Installation in Section 03 Electronic Engine Controls).

NOTE :
0.8 - 1.2 mm gap should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Reinstall the CMP sensor.

10. CHECK CAMSHAFT

- Check the following:
    - Accumulation of debris on the signal plate at the rear of the camshaft.
    - Chipped signal plate teeth at the rear of the camshaft.

Is the check result normal?

Yes >> Go to the next step.

No >> Remove any debris and clean the signal plate at the rear of the camshaft or replace camshaft.

11. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

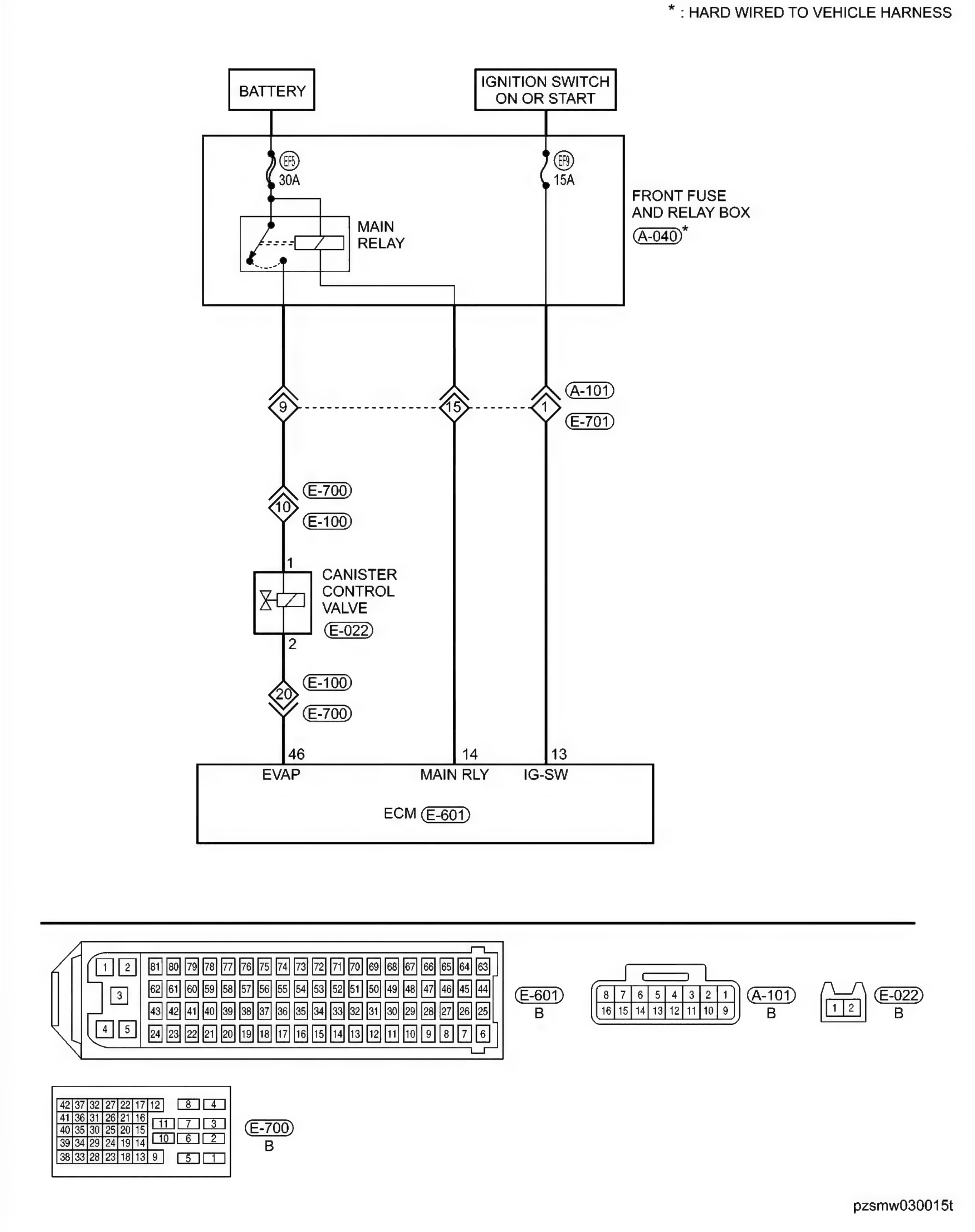
Is DTC P0343 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0444 - Evaporative Emission System Purge Control Valve Circuit Open


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5
30A
EF9
15A
FRONT FUSE AND RELAY BOX
A-040*
MAIN RELAY
A-101
E-701
9
15
1
E-700
10
E-100
1
CANISTER CONTROL VALVE
E-022
2
E-100
20
E-700
46
14
13
EVAP
MAIN RLY
IG-SW
ECM E-601
E-601 B
A-101 B
E-022 B
E-700 B
pzsmw030015t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	X-431 DATA STREAM
46	Canister control valve	Engine: Running	0 % - 99.9 %

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0444	Evaporative (EVAP) emission system purge control valve circuit open	Engine is running	ECM detected that the improper voltage signal is sent to ECM.	• EVAP canister control • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. CHECK EVAP CANISTER CONTROL VALVE ACTION

- Start the engine and warm it up to the normal operating temperature then select view DTC.
- Touch the EVAP canister valve body, raise engine speed up to 2,000 RPM.
- With the X-431 scan tool, use the ″ACTIVE TEST″ function of the EVAP canister valve, touch the EVAP canister valve body, perform the action test.
- The EVAP canister valve should have a slight vibration.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.

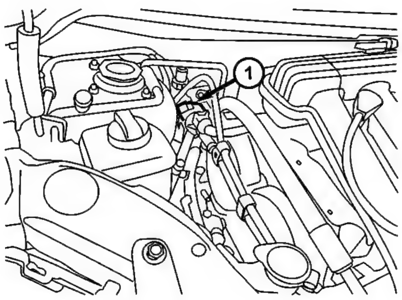
3. CHECK EVAP CANISTER CONTROL VALVE ELECTRICAL CONNECTOR

- Disconnect the EVAP canister control valve (1) electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



pzsmd030011

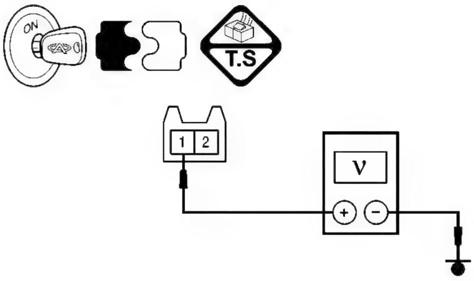
4. CHECK EVAP CANISTER CONTROL VALVE POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check the supply voltage between EVAP canister control valve terminal 1 and ground, terminal side.
- 12 V should exist.

Is the check result normal?

Yes >> Go to step 6.

No >> Go to the next step.



ltsmd030046

5. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Fuse EF5
  - Main relay
  - Front fuse and relay box A-040
  - Harness for an open or short between EVAP canister control valve and fuse EF5
  - Harness for an open or short between ECM terminal 14 and fuse EF5

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace malfunctioning part(s).

6. CHECK EVAP CANISTER CONTROL VALVE CONTROL CIRCUIT FOR AN OPEN

- Check the voltage between EVAP canister control valve terminal 2 and ground, terminal side.
- Approximately 3.6 V should exist.

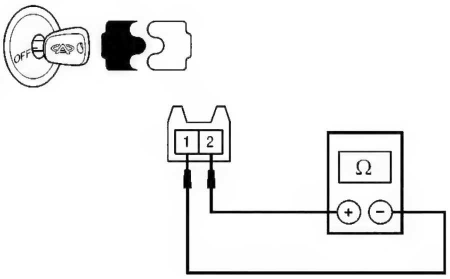
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace circuit for an open in harness or connectors.
If harness is normal, go to the next step.

7. CHECK EVAP CANISTER CONTROL VALVE

- Turn ignition switch off.
- Remove EVAP canister control valve.
- Check the resistance as shown in the following table:

EVAP CANISTER CONTROL VALVE		
TERMINAL NO.	**RESISTANCE Ω (20°C)**	
1 & 2	Approximately 26	

ltsmd030047

- Check air passage continuity and operation when applying 12 V to terminal 1 and ground to terminal 2.
- The air passage should be opened.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace EVAP canister control valve.

8. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC P0444 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0506 - Idle Control System RPM Lower Than Expected

On Board Diagnostic Logic

- Self-diagnosis detection logic.
- If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0506	Idle control system RPM lower than expected	• Engine is running • With the engine idling, the brake applied, engine run time below a calibrated minimum value, and no VSS, MAF/MAP, ECT, TPS, ETC, Crankshaft Position sensor, fuel system, or injector DTCs present.	ECM detected that the idle speed is less than the acceptable range.	• Electronic throttle control actuator • Intake air leak • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK INTAKE AIR LEAK

- Start the engine and let it idle.
- Listen for an intake air leak after the mass air flow sensor.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair the air leak as necessary.

2. CHECK THE ELECTRONIC THROTTLE CONTROL ACTUATOR

- Check the electronic throttle opening degrees.
- Check the electronic throttle clearance.

Is the check result normal?

Yes >> Go to the next step.

No >> Clean or replace as necessary.

3. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

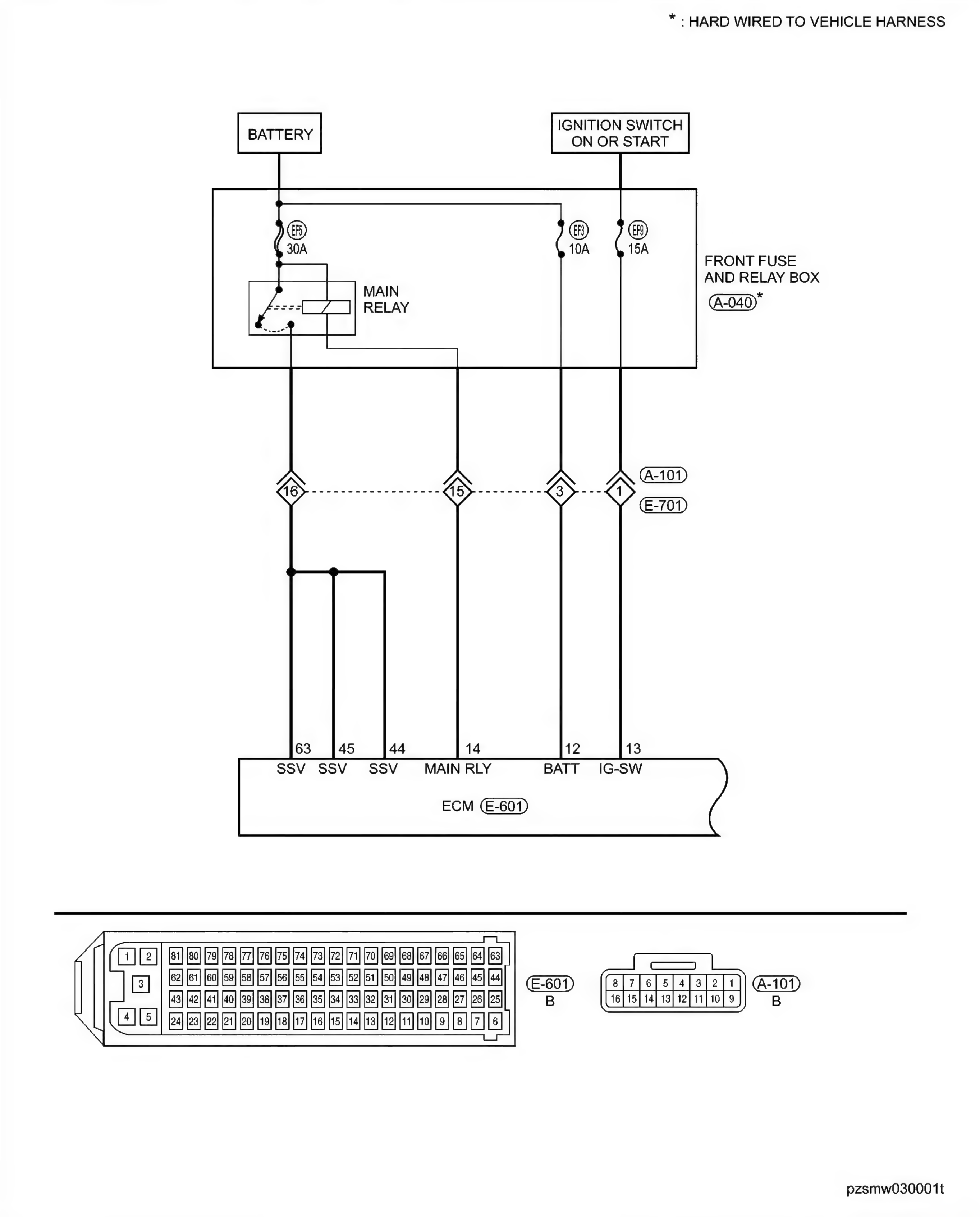
Is DTC P0506 still present?

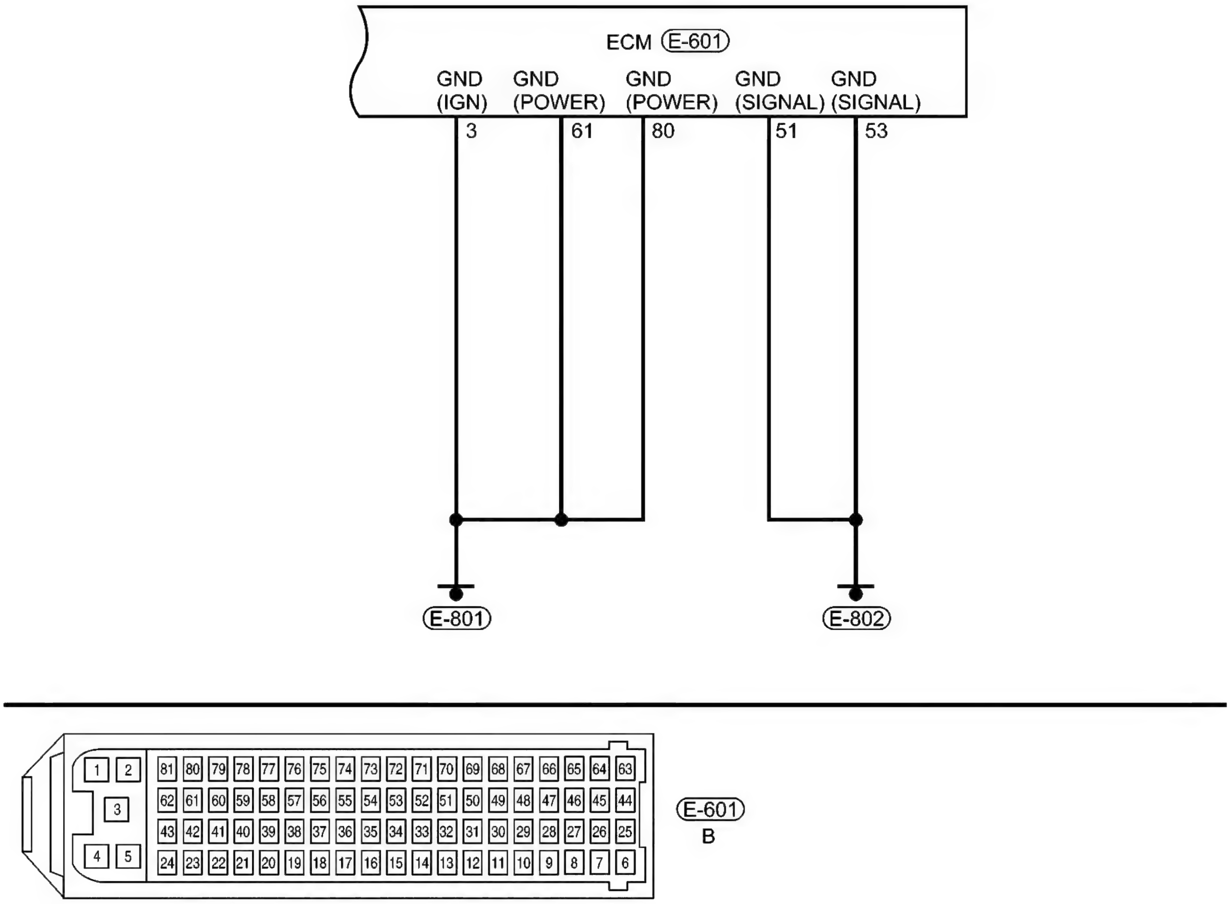
Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0562 - System Voltage Low Voltage
P0563 - System Voltage High Voltage


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5 30A
EF3 10A
EF9 15A
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
16
15
3
1
A-101
E-701
63 SSV
45 SSV
44 SSV
14 MAIN RLY
12 BATT
13 IG-SW
ECM E-601
E-601 B
A-101 B
pzsmw030001t


ECM E-601
GND (IGN)
GND (POWER)
GND (POWER)
GND (SIGNAL)
GND (SIGNAL)
3
61
80
51
53
E-801
E-802
1 2
3
4 5
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B

pzsmw030002t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0562	System voltage low voltage	Ignition switch: ON	ECM detected that the battery voltage is excessive low.	• Charge system • Harness or connector • Battery • ECM
P0563	System voltage high voltage		ECM detected that the battery voltage is excessive high.	• Charge system • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :

- Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.
- Inspect the fuses. If an open fuse is found, use the electrical schematics as a guide and inspect the wiring and connectors for damage.

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

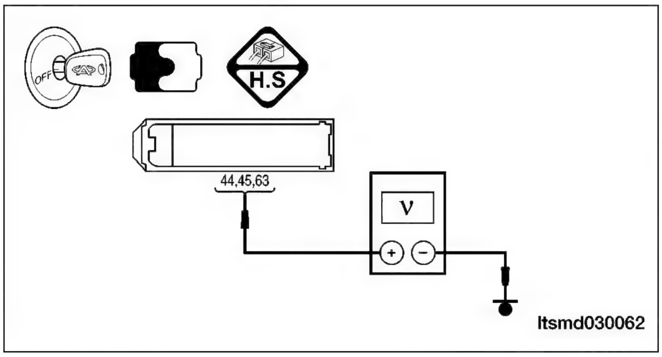
Yes >> Go to the next step.

No >> Repair or replace ground connections.

2. CHECK ECM POWER SUPPLY

- Check ECM supply between terminal 44, 45 or 63 and ground in the ECM electrical connector E-601, terminal side.

Is the voltage between 9 - 17 V?



Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> If the voltage is less than 9 V, go to step 3.
If the voltage is more than 17 V, go to step 6.

3. CHECK SYSTEM VOLTAGE

- Connect the ECM electrical connector.
- Start the engine, raise the speed over 1000 RPM.
- Measure the charging system voltage with a digital multimeter at the battery positive and negative terminals.

Is the voltage less than 9 V?

Yes >> Check the charging system.

No >> Go to the next step.

4. CHECK THE BATTERY

- Raise the speed over 1000 RPM for a few minutes.
- Turn ignition switch off.
- Measure the voltage drop with a digital multimeter at the battery positive and negative terminals while cranking the engine.
- Battery voltage should be more than approximate 9 V.

Is the check result normal?

Yes >> Go to the next step.

No >> Charge or replace the battery.

5. CHECK ECM POWER SUPPLY CIRCUIT

- Measure the resistance between ECM terminal 44, 45 or 63 and battery positive terminal.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Check fuse.
Inspect the harness.
Check all related components.

6. CHECK SYSTEM VOLTAGE

- Start the engine and raise the engine speed over 1000 RPM.
- Measure the charging voltage with a digital multimeter at the battery positive and negative terminal.

Is the voltage more than 17 V?

Yes >> Replace the AC generator.

No >> Go to the next step.

7. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC P0562 or P0563 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0602 - Control Module ECM Programming Error

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	POSSIBLE CAUSE
P0602	Control module programming error	• ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.
- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK DTC

- Perform DTC confirmation procedure.

Is DTC P0602 present?

Yes >> Go to the next step.

No >> The conditions that caused this code to set are not present at this time (See Diagnostic Help in Section 03 Electronic Engine Controls).

2. CHECK ECM POWER SUPPLY AND GROUND

- Check the ECM supply voltage circuit for voltage, ground circuit for an open, high resistance or any short circuits that exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short in harness and connectors.

3. PROGRAM ECM

- With X-431 scan tool, program the ECM before replacing the ECM. and view the DTC with X-431.
- With X-431 scan tool view the DTCs

Is DTC P0602 still present?

Yes >> Go to the next step.
Refer to any Technical Bulletins that have been issued.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

4. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is the check result normal?

Yes >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

No >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

P0604 - Internal Controller Module Random Access Memory (RAM) Error
P0605 - Internal Controller Module ROM Test Error
P0606 - ECM Processor

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
P0604	Internal Controller Module Random Access Memory (RAM) Error	ECM detected an internal failure.	• ECM
P0605	Internal Controller Module ROM Test Error		
P0606	ECM Processor		

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK DTC

- Perform DTC confirmation procedure.

Is DTC P0604, P0605 or P0606 present?

Yes >> Go to the next step.

No >> The conditions that caused this code to set are not present at this time (See Diagnostic Help in Section 03 Electronic Engine Controls).

2. CHECK ECM POWER SUPPLY AND GROUND

- Check the ECM supply voltage circuit for voltage, ground circuit for an open, high resistance or any short circuits that exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or short in harness and connectors.

3. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

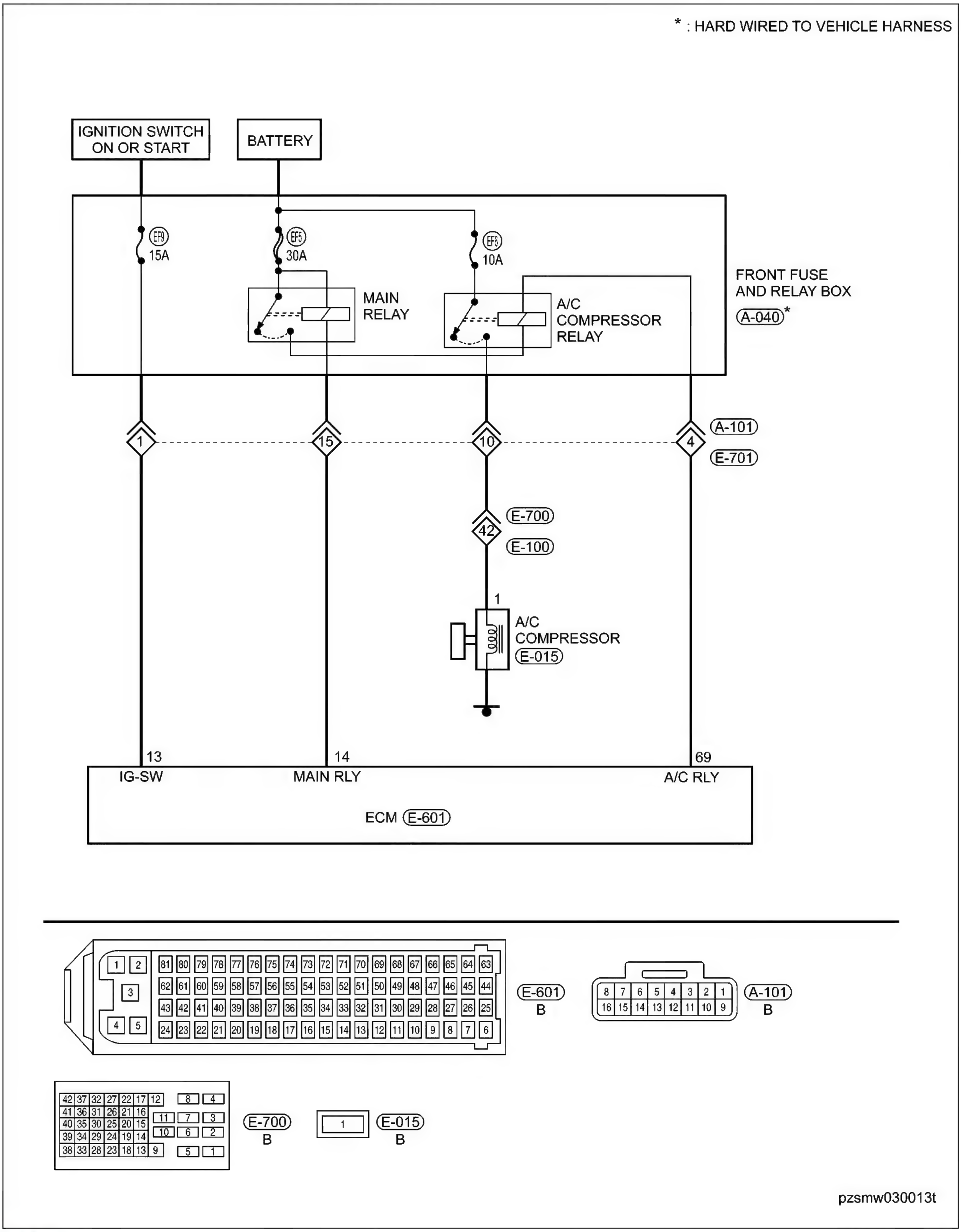
Is the check result normal?

Yes >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

No >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

P0645 - A/C Clutch Relay Circuit


* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BATTERY
EF9 15A
EF5 30A
EF6 10A
MAIN RELAY
A/C COMPRESSOR RELAY
FRONT FUSE AND RELAY BOX
A-040*
1
15
10
4
A-101
E-701
E-700
42
E-100
1
A/C COMPRESSOR
E-015
13
IG-SW
14
MAIN RLY
69
A/C RLY
ECM E-601
E-601 B
A-101 B
E-700 B
E-015 B
pzsmw030013t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
69	Air compressor relay	• Ignition switch ON or after engine is started. • If IAT is above 140.3°C, A/C will be shut off. • If ECT is above 140.3°C, A/C will be shut off. If ECT is below 111.8°C, A/C will be resume. • If engine speed is above 6520 RPM or below 520 RPM, A/C will be shut off. • If A/C high pressure is above 20 bar, A/C will be shut off. If A/C high pressure is below 19.5 bar, A/C will be resume. • If evaporator temperature is below 1.5°C, A/C will be shut off. If evaporator temperature is above 4.5°C, A/C will be resume. • If system voltage is below 8.04 V, A/C will be shut off. If evaporator temperature is above 10.01 V, A/C will be resume.	0 V or 12 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0645	A/C clutch relay circuit	Engine is running	ECM detected that the input signal is out of the acceptable range.	• Fuse • A/C compressor relay • Harness or connectors • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

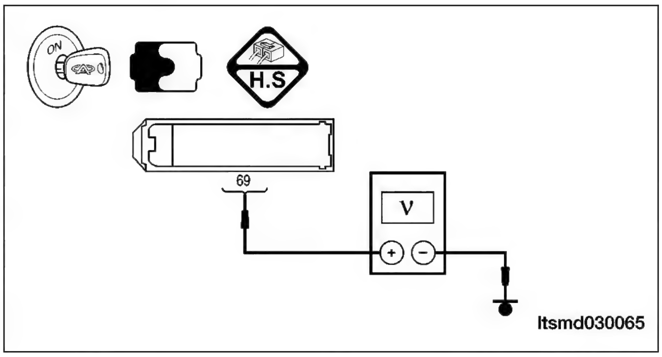
2. CHECK A/C COMPRESSOR RELAY CONTROL CIRCUIT POWER SUPPLY CIRCUIT FOR OPEN

- Turn ignition switch on.
- Turn A/C switch off.
- Check A/C compressor relay control circuit between ECM terminal 69 and ground in the ECM electrical connector E-601, harness side.
- 12 V should exist.

Is the check result normal?

Yes >> Go to step 4.

No >> Go to the next step.



3. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Fuse EF5
  - Body fuse and relay box A-040
  - A/C compressor relay, main relay
  - Harness for an open or short between ECM terminal 14 and fuse EF5
  - Harness for an open or short between ECM terminal 69 and fuse EF5

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace malfunctioning part(s).

4. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

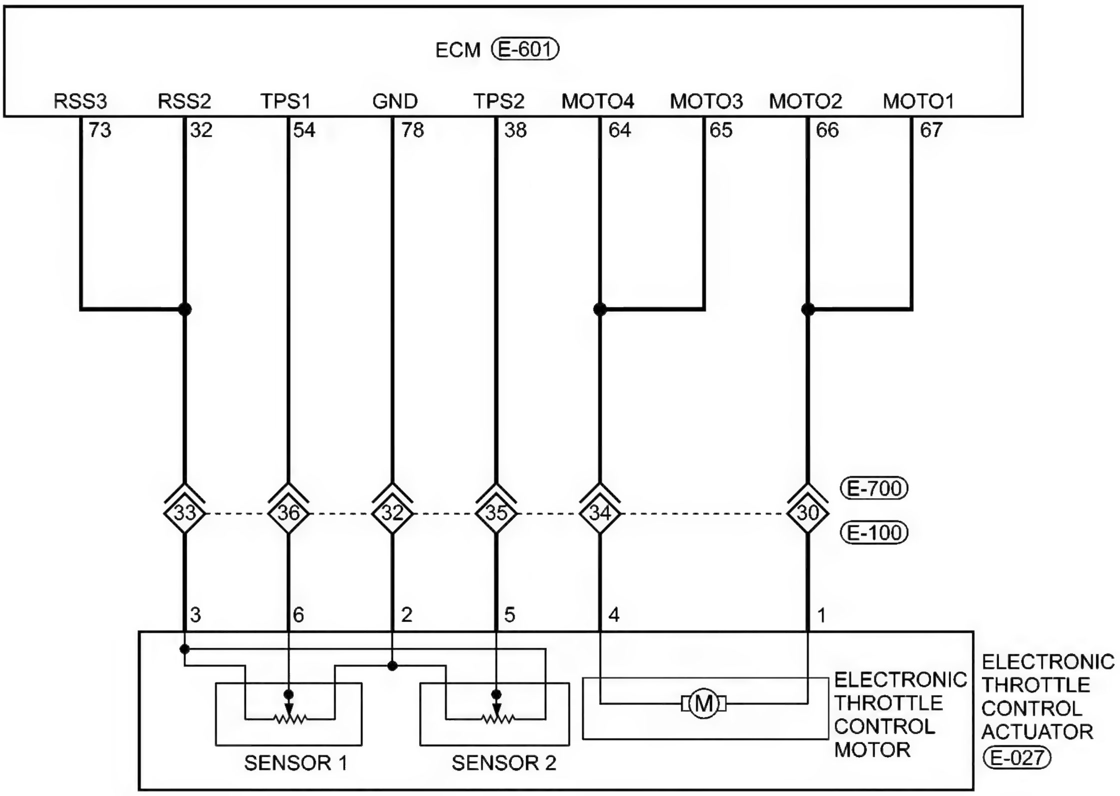
Is DTC P0645 still present?

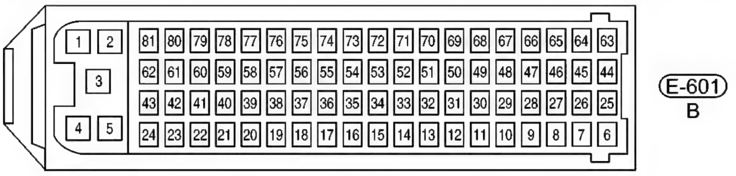
Yes >> Replace the ECM.

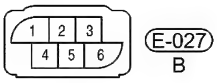
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

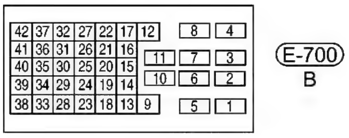
No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P1545 - Throttle Position Control Performance


ECM
E-601
RSS3
RSS2
TPS1
GND
TPS2
MOTO4
MOTO3
MOTO2
MOTO1
73
32
54
78
38
64
65
66
67
33
36
32
35
34
30
E-700
E-100
3
6
2
5
4
1
SENSOR 1
SENSOR 2
M
ELECTRONIC THROTTLE CONTROL MOTOR
ELECTRONIC THROTTLE CONTROL ACTUATOR
E-027




1
2
3
4
5
6
E-027
B



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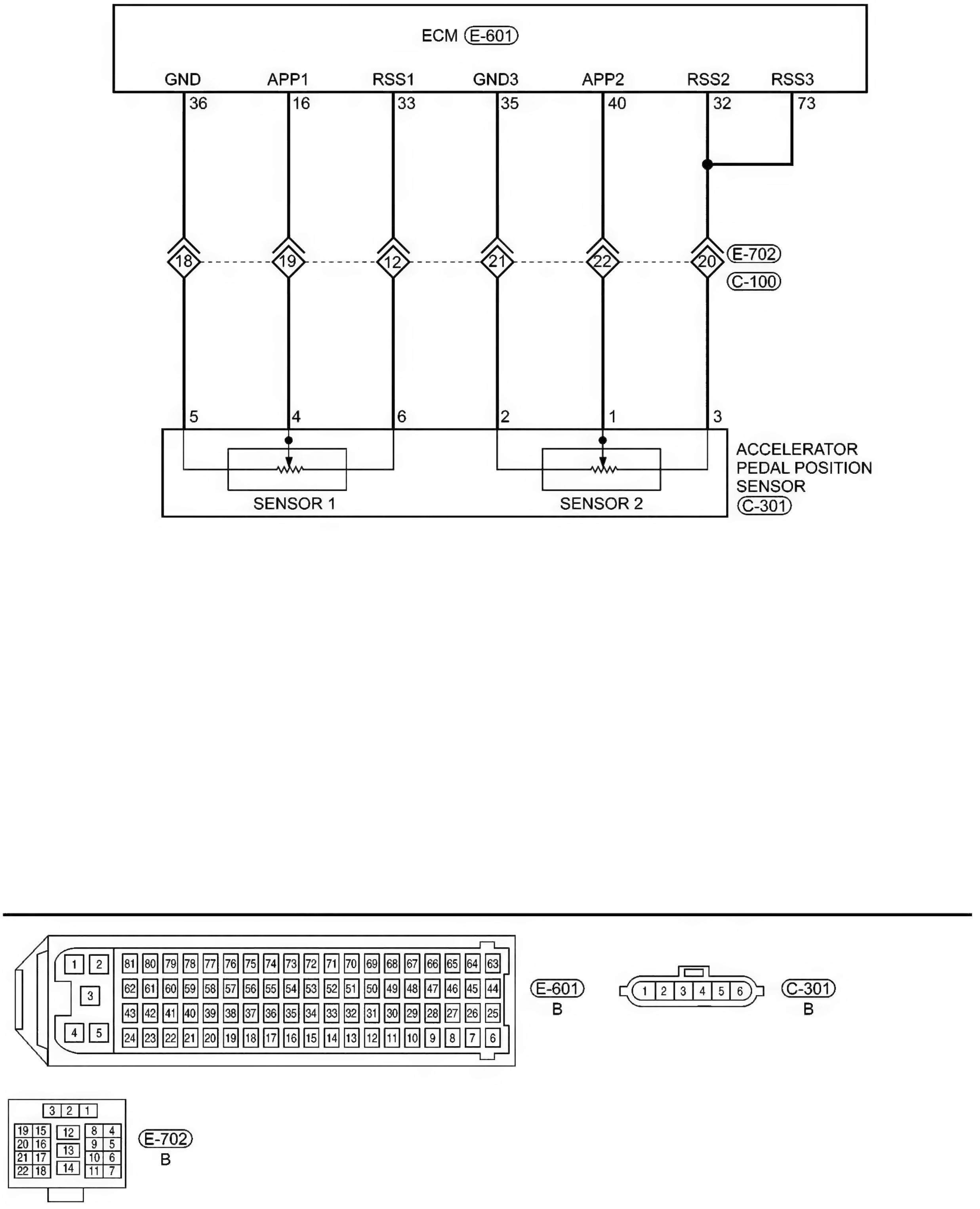
ECM E-601
GND 36
APP1 16
RSS1 33
GND3 35
APP2 40
RSS2 32
RSS3 73
18
19
12
21
22
20
E-702
C-100
5
4
6
2
1
3
SENSOR 1
SENSOR 2
ACCELERATOR PEDAL POSITION SENSOR
C-301
1 2
3
4 5
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B
1 2 3 4 5 6
C-301
B
3 2 1
19 15 20 16 21 17 22 18
12 13 14
8 4 9 5 10 6 11 7
E-702
B

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Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
32	Regulated sensor supply 2	Ignition switch: ON	-	Approximately 5 V
38	Electronic throttle control actuator (position sensor)		Engine: Stopped Accelerator pedal: Fully released	4.24 V
			Engine: Stopped Accelerator pedal: Fully depressed	0.72 V
54	Electronic throttle control actuator		Engine: Stopped Accelerator pedal: Fully released	0.74 V
			Engine: Stopped Accelerator pedal: Fully depressed	4.62 V
64	Electronic throttle control actuator		-	12 V or 0 V
65	Electronic throttle control actuator			
66	Electronic throttle control actuator			12 V or 0 V
67	Electronic throttle control actuator			
73	Regulated sensor supply 3			Approximately 5 V
78	Sensor (GND)			Approximately 0 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P1545	Throttle position control performance	Ignition switch ON or after engine is started.	Rationally incorrect voltage is sent to ECM compared with the signals from TPS1 and TPS2.	• Electronic throttle control actuator (TPS1 and TPS2) • Harness or connectors • Accelerator pedal position sensor 2 • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.

- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

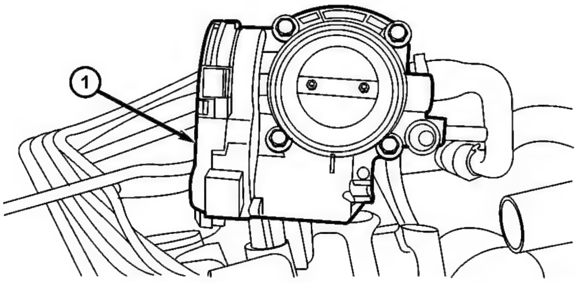
2. CHECK THROTTLE POSITION SENSOR ELECTRICAL CONNECTOR

- Disconnect the TPS (1) electrical connector E-027.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



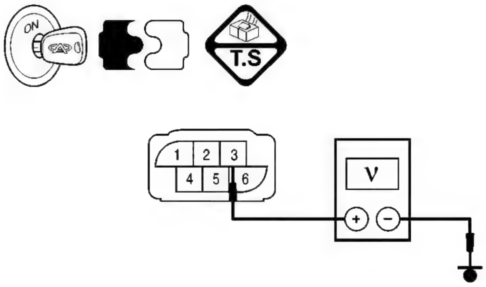
3. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT - (1)

- Turn ignition switch on.
- Check the voltage between terminal 3 and ground in the TPS electrical connector E-027, terminal side.
- Approximately 5 V should exist.

Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.



4. CHECK TPS POWER SUPPLY CIRCUIT - (2)

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check continuity between TPS terminal 3 and ECM terminal 32.
- Check continuity between TPS terminal 3 and ECM terminal 73.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the open circuit.

5. CHECK TPS POWER SUPPLY CIRCUIT - (3)

- Check harness for a short to power and short to ground, between the following terminals:

TPS POWER SUPPLY CIRCUIT	
ECM TERMINAL	**TPS/APPS TERMINAL**
32 or 73	TPS terminal 3
32 or 73	APP sensor terminal 3
33	APP sensor terminal 6

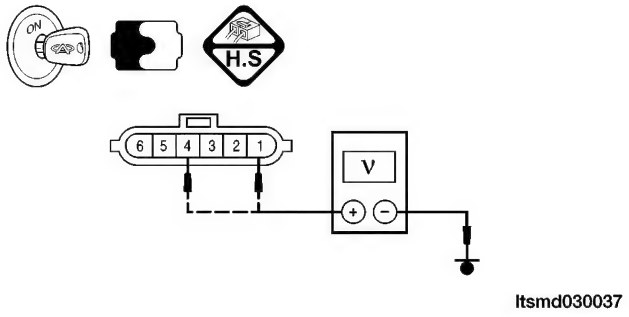
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace short to ground or short to power in harness or connectors.

6. CHECK THE APP SENSOR

- Connect all harness connectors that have been disconnected.
- Turn ignition switch on.
- Install a digital multimeter to the APP sensor as shown in the following:

APP SENSOR CIRCUIT		
ECM TERMINAL	**APPS TERMINAL**	
16	APP sensor terminal 4	
40	APP sensor terminal 1	

- Check voltage between ECM terminals 16 (APP sensor 4), ECM terminal 40 (APP sensor 1) and ground under the following conditions:

APP SENSOR REFERENCE DATA				
TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
16	Accelerator Pedal Position Sensor	Ignition switch: ON	Engine stopped Accelerator pedal: Fully released	0.72 - 0.74 V
			Engine stopped Accelerator pedal: Fully depressed	3.95 V
40	Accelerator Pedal Position Sensor		Engine stopped Accelerator pedal: Fully released	0.36 - 0.37 V
			Engine stopped Accelerator pedal: Fully depressed	1.97 V

Is the check result normal?

Yes >> Go to step 11.

No >> Replace the Accelerator Pedal Assembly (See Accelerator Pedal Position Sensor Removal & Installation in Section 03 Electronic Engine Controls).
Perform accelerator pedal position learning.
Perform throttle valve position learning.

7. CHECK THE TPS SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check continuity between the electronic throttle control actuator terminal 5 and ECM terminal 38, and electronic throttle control actuator terminal 6 and ECM terminal 54.
- Continuity should exist.
- Check harness for short to power or short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the open circuit, short to power or short to ground in harness or connectors.

8. CHECK THE TPS GROUND CIRCUIT FOR AN OPEN OR SHORT

- Check continuity between the electronic throttle control actuator terminal 2 and ECM terminal 78.
- Continuity should exist.
- Check harness for a short to power and short to ground.

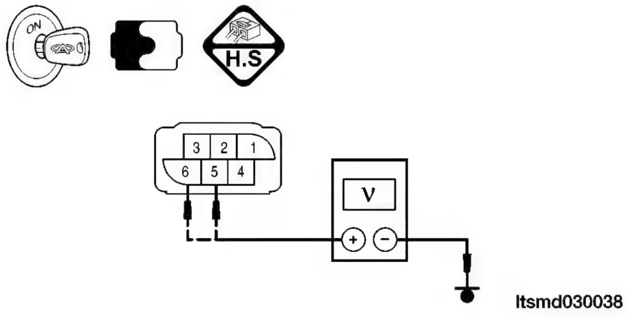
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the open circuit or short to power or short to ground in harness or connectors.

9. CHECK TPS

- Connect all harness connectors that have been disconnected.
- Turn ignition switch on.
- Check voltage between ECM terminals 54 (TPS 1), 38 (TPS 2) and ground under the following conditions:

TPS REFERENCE DATA					
TPS TERMINAL NO.	ITEM	CONDITION		VOLT (DC VOLTAGE)	
5	Electronic throttle control actuator (TPS2)	Ignition switch: ON	Engine: Stopped Accelerator pedal: Fully released	4.24 V	
			Engine: Stopped Accelerator pedal: Fully depressed	0.72 V	
6	Electronic throttle control actuator (TPS1)		Engine: Stopped Accelerator pedal: Fully released	0.74 V	
			Engine: Stopped Accelerator pedal: Fully depressed	4.62 V	

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the electronic throttle control actuator, and perform throttle valve position learning.

10. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- See DTC Confirmation Procedure.

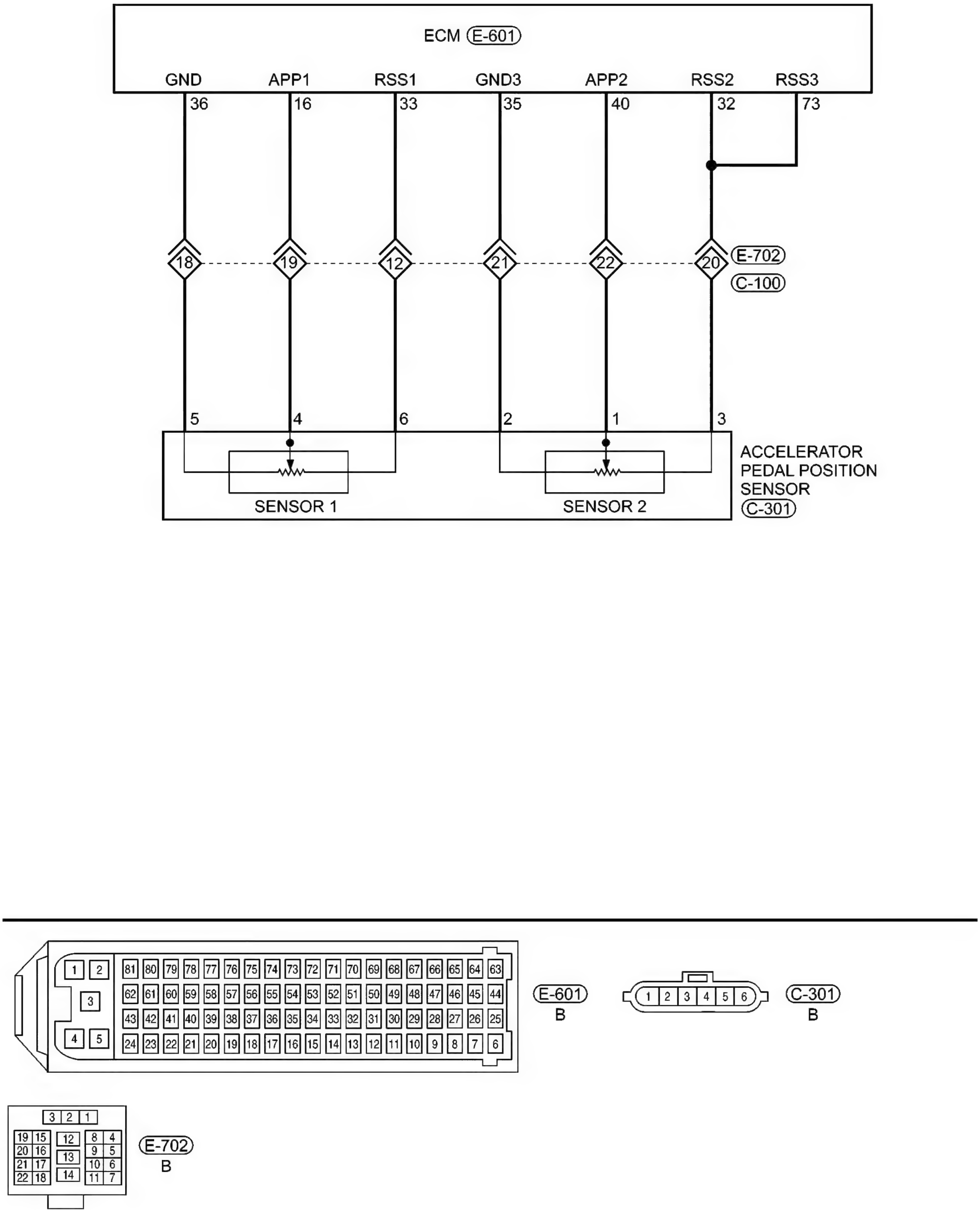
Is DTC P1545 still present?

Yes >> Replace the ECM.

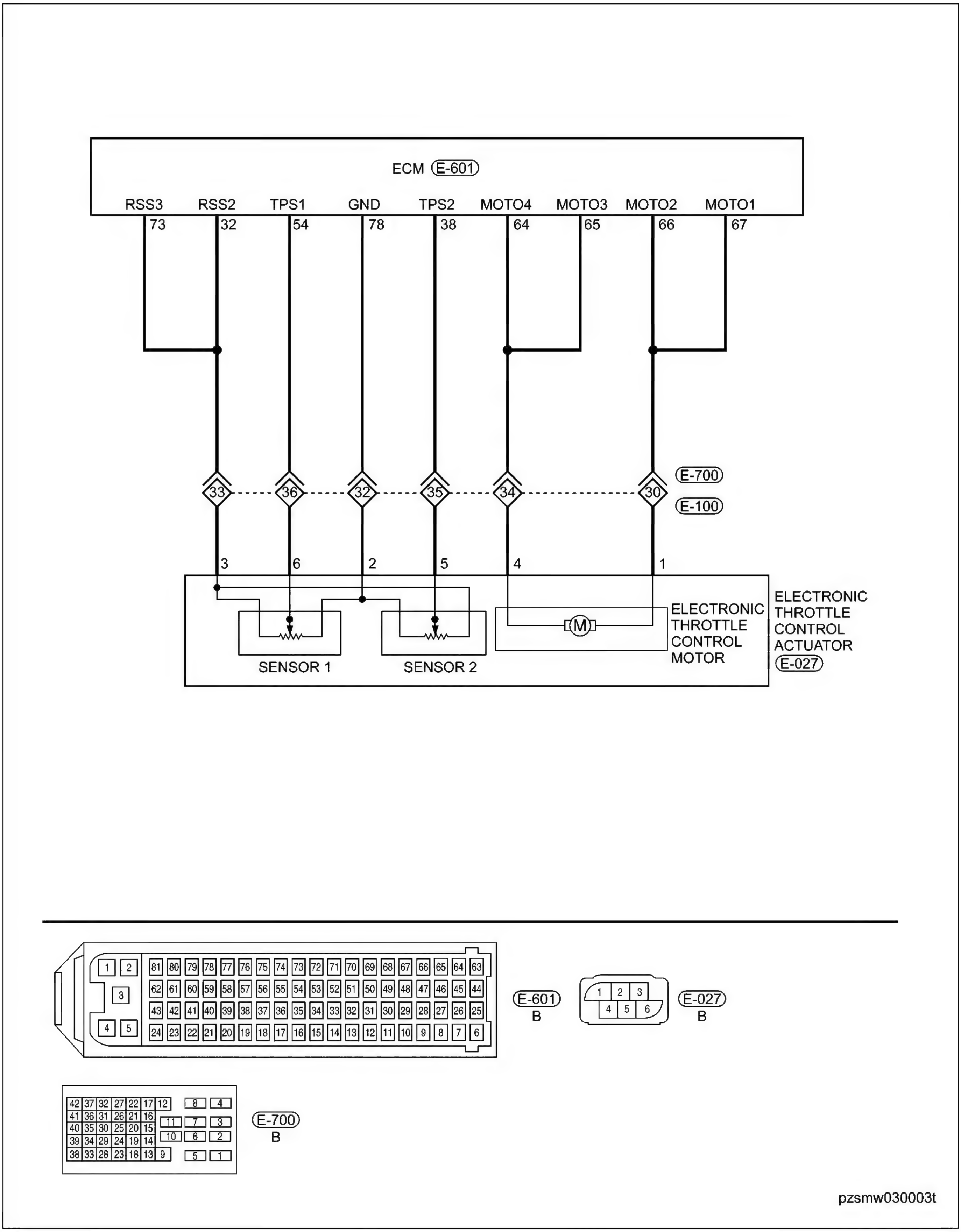
NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P2138 - Pedal Position Sensor Performance


ECM E-601
GND
APP1
RSS1
GND3
APP2
RSS2
RSS3
36
16
33
35
40
32
73
18
19
12
21
22
20
E-702
C-100
5
4
6
2
1
3
SENSOR 1
SENSOR 2
ACCELERATOR PEDAL POSITION SENSOR
C-301
E-601
B
C-301
B
E-702
B

pzsmw030008t


ECM (E-601)
RSS3
RSS2
TPS1
GND
TPS2
MOTO4
MOTO3
MOTO2
MOTO1
73
32
54
78
38
64
65
66
67
33
36
32
35
34
30
(E-700)
(E-100)
3
6
2
5
4
1
SENSOR 1
SENSOR 2
M
ELECTRONIC THROTTLE CONTROL MOTOR
ELECTRONIC THROTTLE CONTROL ACTUATOR
(E-027)
(E-601)
B
(E-027)
B
(E-700)
B
pzsmw030003t

Check reference values between ECM terminals and ground under the following conditions:

ECM TERMINAL NO.	ITEM	CONDITION		DATA (DC VOLTAGE)
16	Accelerator pedal position sensor	Ignition switch: ON	Engine: Stopped Accelerator pedal: Fully released	0.72 - 0.74 V
			Engine: Stopped Accelerator pedal: Fully depressed	3.95 V
32	Regulated sensor supply 2		-	Approximately 5 V
33	Regulated sensor supply 1		-	Approximately 5 V
35	Sensor (GND)		-	Approximately 0 V
36	Sensor (GND)		-	Approximately 0 V
40	Accelerator Pedal Position Sensor		Engine: Stopped Accelerator pedal: Fully released	0.36 - 0.37 V
			Engine: Stopped Accelerator pedal: Fully depressed	1.97 V
73	Regulated sensor supply 3		-	Approximately 5 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P2138	Accelerator pedal position sensor performance	Ignition switch ON or after engine is started	Rationally incorrect voltage is sent to ECM compared with the signals from APPS1 and APPS2.	• Accelerator pedal position sensor 1 and 2 • Harness or connectors • Electronic throttle control actuator (TPS1 and TPS2) • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ECM.
- Start the engine and warm it to normal operating temperature.
- With the scan tool, select view DTCs in the ECM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 03 Electronic Engine Controls for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 03 Electronic Engine Controls).
- Inspect ground connections E-801 and E-802 mounting positions (See Vehicle Wiring Harness Layout - ECM Control Harness in Section 16 Wiring).

Are the ground connections OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

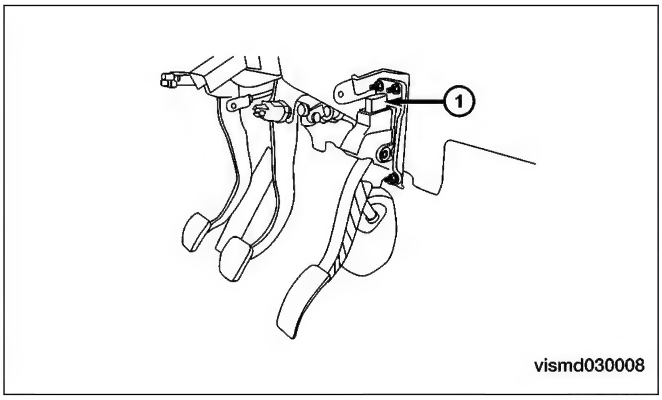
2. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 (APPS1) POWER SUPPLY CIRCUIT

- Disconnect the APPS1 electrical connector C-301 (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



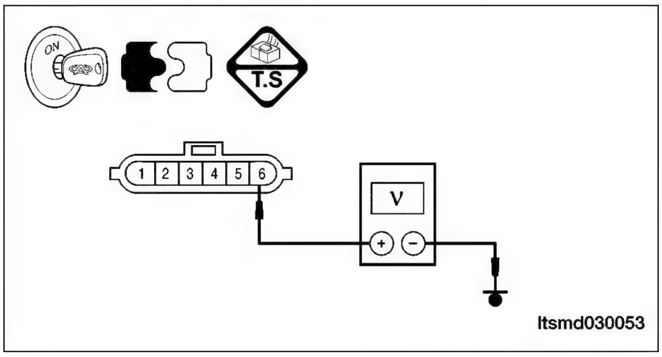
3. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 (APPS1) POWER SUPPLY CIRCUIT

- Turn ignition switch on.
- Check the voltage between terminal 6 and ground in the APPS1 electrical connector C-301, terminal side.
- Approximately 5 V should exist.

Is the check result normal?

Yes >> Go to step 5.

No >> Go to the next step.



4. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Harness connectors E-702, C-100
  - Harness for an open or short between APPS1 and ECM

Is the check result normal?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair or replace the open or short circuit in harness or connectors.

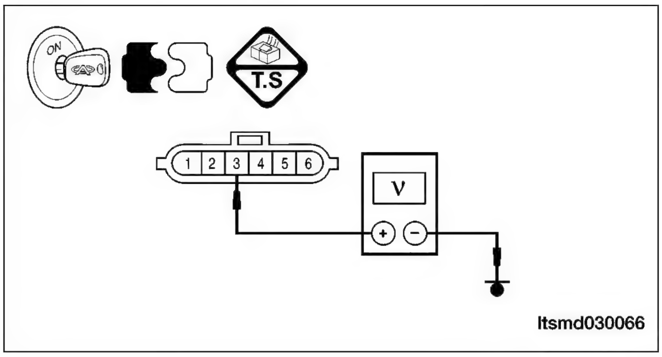
5. CHECK ACCELERATOR PEDAL POSITION SENSOR 2 (APPS2) POWER SUPPLY CIRCUIT

- Check the voltage between APPS2 terminal 3 and ground in the APPS2 electrical connector C-301, terminal side.
- Approximately 5 V should exist.

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.



6. DETECT MALFUNCTIONING PART

- Check the following for a possible malfunction:
  - Harness connectors E-702, C-100
  - Harness for open or short between APPS2 and ECM

Is the check result normal?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> Repair or replace the open or short circuit in harness or connectors.

7. CHECK TPS POWER SUPPLY CIRCUIT

- Check harness for short to power and short to ground between the following terminals:

TPS POWER SUPPLY CIRCUIT	
ECM TERMINAL	**TPS TERMINAL**
32 or 73	3

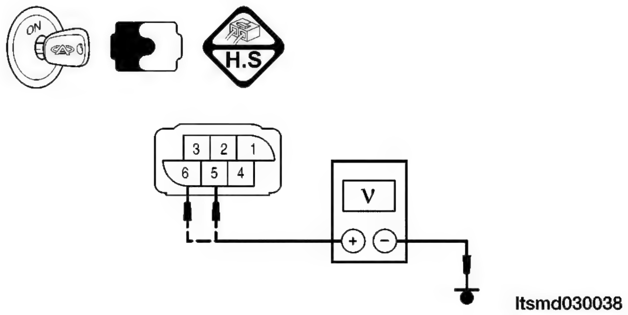
Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for short to ground or short to power in harness or connectors.

8. CHECK THE TPS

- Connect all harness connectors that have been disconnected.
- Turn ignition switch on.
- Check the voltage between ECM terminals 54 (TP sensor 1 (TPS1) signal), and 38 (TP sensor 2 (TPS2) signal) and ground under the following conditions:

TPS REFERENCE DATA					
TPS TERMINAL NO.	**ITEM**	**CONDITION**		**VOLT (DC VOLTAGE)**	
5	Electronic throttle control actuator (TPS2)	Ignition switch: ON	Engine: Stopped Accelerator pedal: Fully released	4.24 V	 Itsmd030038
			Engine: Stopped Accelerator pedal: Fully depressed	0.72 V	
6	Electronic throttle control actuator (TPS1)		Engine: Stopped Accelerator pedal: Fully released	0.74 V	
			Engine: Stopped Accelerator pedal: Fully depressed	4.62 V	

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the TPS circuits for a short or open.
If the TPS circuits are normal, replace the electronic throttle control actuator.
Perform throttle valve position self-learning.

9. CHECK THE APPS GROUND CIRCUIT FOR AN OPEN OR SHORT

- Turn ignition switch off.
- Disconnect the ECM electrical connector.
- Check continuity between APPS2 terminal 2 and ECM terminal 35, and APPS1 terminal 5 and ECM terminal 36.
- Continuity should exist.
- Check harness for a short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the open circuit or short to power in harness or connectors.

10. CHECK APPS SIGNAL CIRCUIT FOR AN OPEN OR SHORT

- Check continuity between APPS1 terminal 4 and ECM terminal 16, APPS2 terminal 1 and ECM terminal 40.
- Continuity should exist.
- Check harness for a short to power or short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the open circuit or short to power or short to ground in harness or connectors.

11. CHECK APP SENSOR

- Connect all harness connectors that have been disconnected.
- Turn ignition switch on.
- Check voltage between ECM terminal 16 (APP sensor 1), and ECM terminal 40 (APP sensor 2) and ground under the following conditions:

APP SENSOR REFERENCE DATA				
ECM TERMINAL NO.	**ITEM**	**CONDITION**		**VOLT (DC VOLTAGE)**
16	Accelerator pedal position sensor 1 (APPS1)	Ignition switch: ON	Engine: Stopped Accelerator pedal: Fully released	0.72 - 0.74 V
			Engine: Stopped Accelerator pedal: Fully depressed	3.95 V
40	Accelerator pedal position sensor 2 (APPS2)		Engine: Stopped Accelerator pedal: Fully released	0.36 - 0.37 V
			Engine: Stopped Accelerator pedal: Fully depressed	1.97 V

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the Accelerator Pedal Assembly (See Accelerator Pedal Position Sensor Removal & Installation in Section 03 Electronic Engine Controls).
Perform accelerator pedal position learning.
Perform throttle valve position learning.

12. CHECK DTC

- With the X-431 scan tool, read ECM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC P2138 still present?

Yes >> Replace the ECM.

NOTE : The Immobilizer control module must be matched to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

ON-VEHICLE SERVICE

Engine Coolant Temperature Sensor

Description

The Engine Coolant Temperature (ECT) sensor threads into the coolant outlet connector. The ECT sensor is a negative thermal coefficient sensor.

Operation

The ECT provides an input to the Engine Control Module (ECM). As temperature increases, resistance of the sensor decreases. As coolant temperature varies, the ECT sensor resistance changes resulting in a different voltage value at the ECT sensor signal circuit. The ECM uses the input to control air-fuel mixture, timing, and radiator fan on/off times.

Removal & Installation

WARNING!

Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

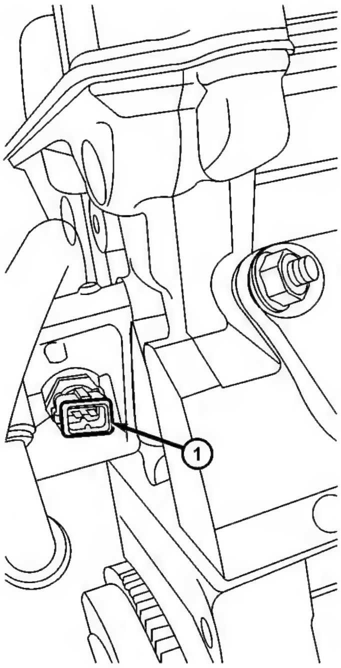
1. Disconnect the negative battery cable.
2. Drain the cooling system (See Cooling System Draining Procedure in Section 06 Cooling System).
3. Disconnect the coolant temperature sensor electrical connector.

CAUTION:
Remove the coolant temperature sensor when the engine is cold.

4. Remove the engine coolant temperature sensor (1).
   (Tighten: Engine coolant temperature sensor to 20 N·m)
5. Discard the O-ring.
6. Installation is in the reverse order of removal.

Installation Notes:

- After installing the ECT sensor, verify the cooling system is filled to proper specifications.



pzsm030012

Knock Sensor

Description

The knock sensor is attached to the cylinder block. The knock sensor is designed to detect engine vibration that is caused by detonation.

Operation

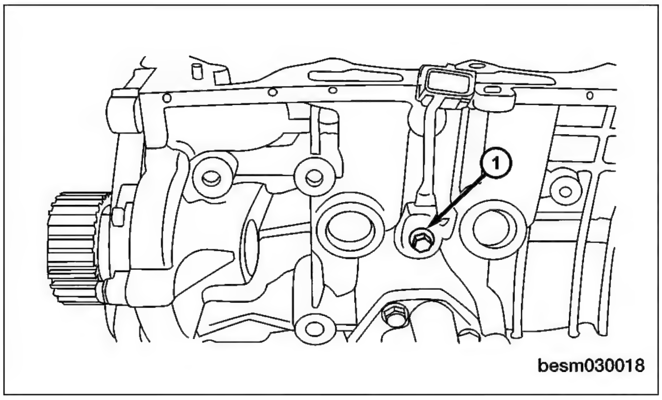
When the knock sensor detects a knock in one of the cylinders, it sends an input signal to the Engine Control Module (ECM). In response, the ECM retards ignition timing for all cylinders by a specified amount.

Knock sensors contain a piezoelectric material which constantly vibrates and sends an input voltage (signal) to the ECM while the engine operates. As the intensity of the crystal's vibration increases, the knock sensor output voltage also increases.

The ECM ignores knock sensor input during engine idle conditions. Once the engine speed exceeds a specified value, knock retard is allowed.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the knock sensor electrical connector.
3. Remove the knock sensor retaining bolt (1) and remove the knock sensor.
   (Tighten: Knock sensor retaining bolt to 20 N·m)
4. Installation is in the reverse order of removal.



Oxygen Sensor

Description

This vehicle is equipped with two oxygen sensors (upstream oxygen sensor & downstream oxygen sensor). The oxygen sensors are located before and after the three way catalyst. The oxygen sensors continually monitor the oxygen level in the exhaust gas. The sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 volt in richer conditions to 0 volt in leaner conditions.

Operation

The O_2 sensors produce voltages from 0 to 1 volt, depending upon the oxygen content of the exhaust gas. When a large amount of oxygen is present (caused by a lean air/fuel mixture, can be caused by misfire and exhaust leaks), the sensors produces a low voltage. When there is a lesser amount of oxygen present (caused by a rich air/fuel mixture, can be caused by internal engine problems) it produces a higher voltage. By monitoring the oxygen content and converting it to electrical voltage, the sensors act as a rich-lean switch.

The oxygen sensors are equipped with a heating element that keeps the sensors at proper operating temperature during all operating modes. Maintaining correct sensor temperature at all times allows the system to enter into closed loop operation sooner. Also, it allows the system to remain in closed loop operation during periods of extended idle.

Upstream Oxygen Sensor

The input from the upstream heated oxygen sensor tells the Engine Control Module (ECM) the oxygen content of the exhaust gas. Based on this input, the ECM fine tunes the air-fuel ratio by adjusting injector pulse width.

Downstream Oxygen Sensor

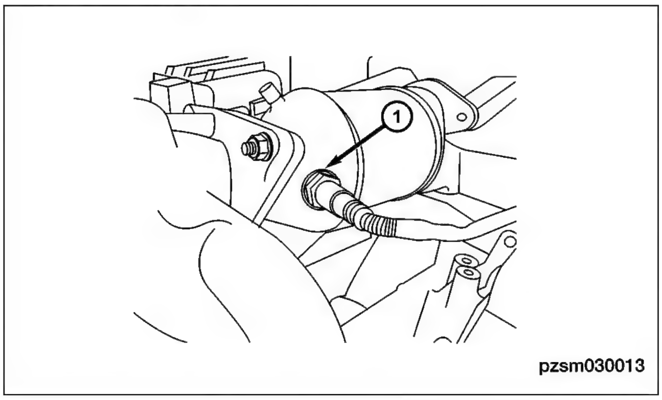
The downstream heated oxygen sensor signal is used to detect catalytic convertor deterioration. As the convertor deteriorates, the signal from the downstream sensor begins to match the upstream sensor signal except for a slight time delay. By comparing the downstream heated oxygen sensor signal to the signal from the upstream sensor, the ECM calculates catalytic convertor efficiency. This calculation is also used to establish the upstream O_2 goal voltage (switching point).

Removal & Installation - Upstream Oxygen Sensor

1. Disconnect the negative battery cable.
2. Disconnect the oxygen sensor electrical connector.

CAUTION:
Remove the oxygen sensor after the exhaust pipe has cooled.

3. Remove the upstream oxygen sensor (1).
   (Tighten: Upstream oxygen sensor to 45 N·m)



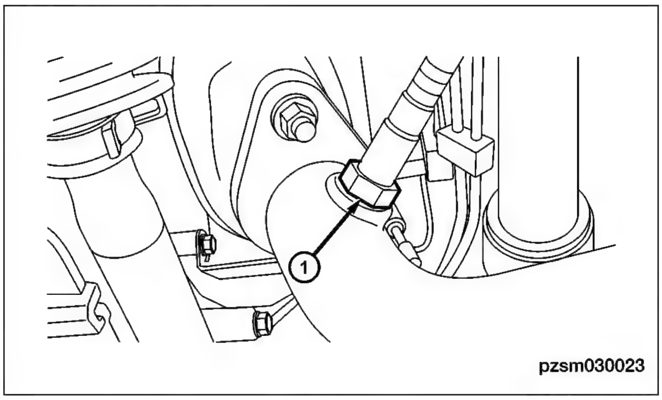
4. Installation is in the reverse order of removal.

Removal & Installation - Downstream Oxygen Sensor

1. Disconnect the negative battery cable.
2. Disconnect the oxygen sensor electrical connector.

CAUTION:
Remove the oxygen sensor after the exhaust pipe has cooled.

3. Remove the downstream oxygen sensor (1).
   (Tighten: Downstream oxygen sensor to 45 N·m)



4. Installation is in the reverse order of removal.

Crankshaft Position Sensor

Description

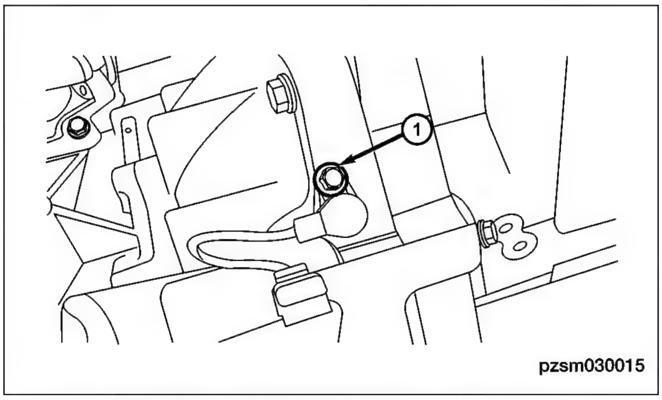
The Crankshaft Position (CKP) sensor is located on the flywheel shell facing the gear teeth of the crankshaft signal plate. The CKP sensor monitors any fluctuation in engine RPM. The sensor consists of a permanent magnet and an induction coil.

Operation

The CKP sensor generates pulse signals that are sent to the Engine Control Module (ECM). The ECM interprets the sensor signal to determine the crankshaft position. The ECM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the CKP sensor electrical connector.
3. Remove the CKP sensor retaining bolt (1) and remove the CKP sensor.
   (Tighten: CKP sensor retaining bolt to 10 N·m)
4. Installation is in the reverse order of removal.



Camshaft Position Sensor

Description

The Camshaft Position (CMP) sensor is mounted on the cylinder head cover. The sensor consists of a permanent magnet and Hall IC.

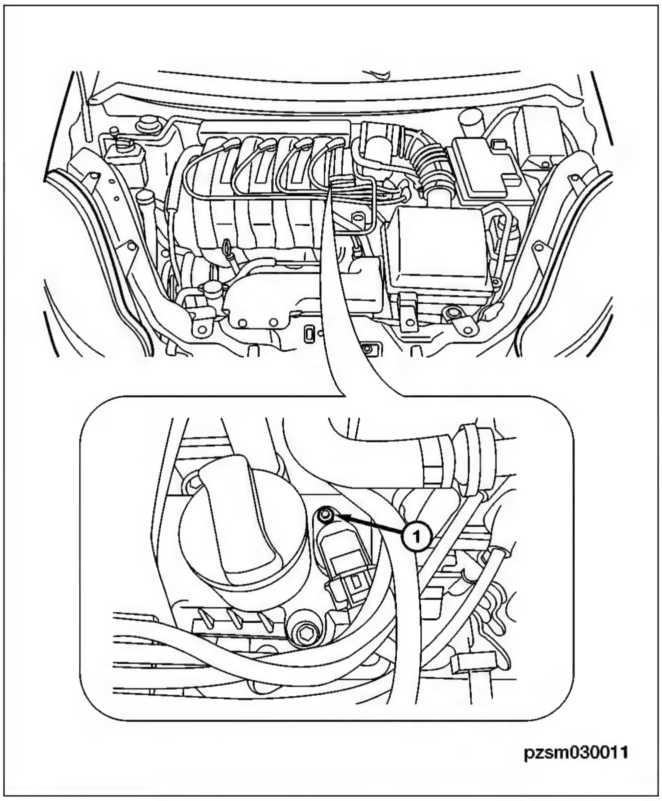
Operation

The CMP sensor detects the position of the camshaft and identifies when the number one piston is on its compression stroke. A signal is then sent to the Engine Control Module (ECM) and used for synchronizing the firing of sequential fuel injectors.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the CMP sensor electrical connector.

3. Remove the CMP sensor retaining bolt (1). (Tighten: Camshaft position sensor retaining bolt to 7 N·m)
4. Pull the CMP sensor up and remove from the cylinder head cover.
5. Installation is in the reverse order of removal.



pzsm030011

Vehicle Speed Sensor

Description

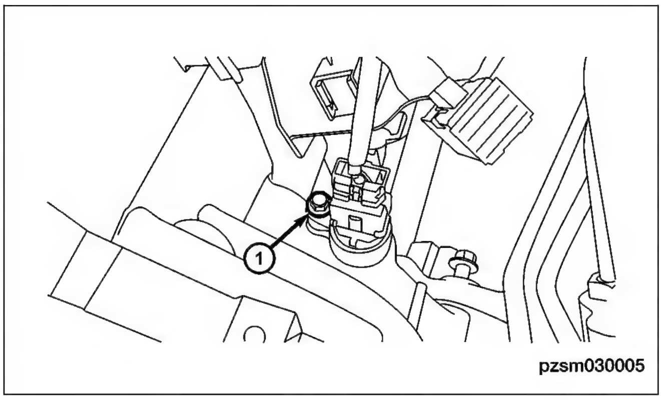
The vehicle speed sensor is mounted to the transaxle housing.

Operation

The vehicle speed sensor generates a signal that the Engine Control Module (ECM) utilizes to perform engine and transaxle functions.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the vehicle speed sensor electrical connector.
3. Remove the vehicle speed sensor mounting bolt (1).
   (Tighten: Vehicle speed sensor mounting bolt to 10 N·m)
4. Remove the vehicle speed sensor carefully.
5. Installation is in the reverse order of removal.



pzsm030005

Accelerator Sensor

Description

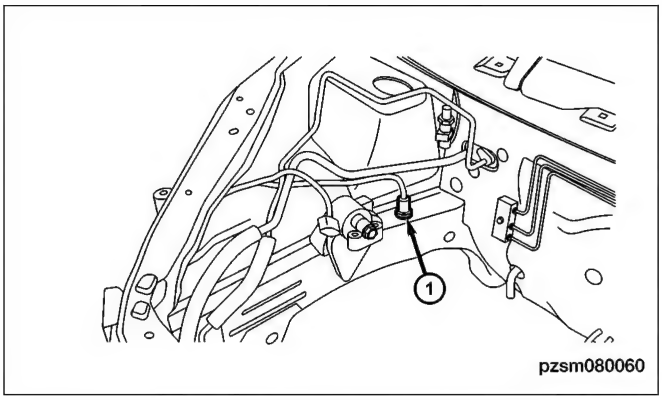
The accelerator sensor is located on the right front body crossbeam.

Operation

The accelerator sensor monitors road conditions, and is designed to detect engine misfires. It sends a signal to the Engine Control Module (ECM), and the ECM determines if a possible misfire condition exists.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the accelerator sensor electrical connector.
3. Remove the accelerator sensor (1).
4. Installation is in the reverse order of removal.



Manifold Absolute Pressure Sensor

Description

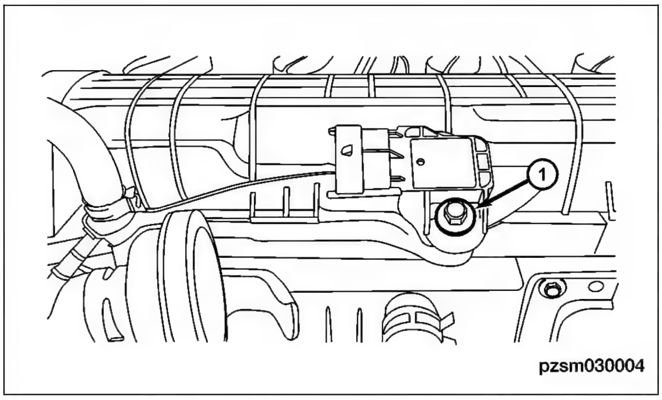
The Manifold Absolute Pressure (MAP) sensor, is mounted to the front of the engine.

Operation

The MAP sensor monitors the pressure in the intake manifold. The pressure in the manifold moves a diaphragm connected to resistors which alter their resistance values. The MAP sensor sends an output voltage signal to the ECM to determine the pressure in the intake manifold.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the MAP sensor electrical connector.
3. Remove the MAP sensor mounting bolt (1).
   (Tighten: MAP sensor mounting bolt to 6 N·m)
4. Remove the MAP sensor.
5. Installation is in the reverse order of removal.



Accelerator Pedal Position Sensor

Description

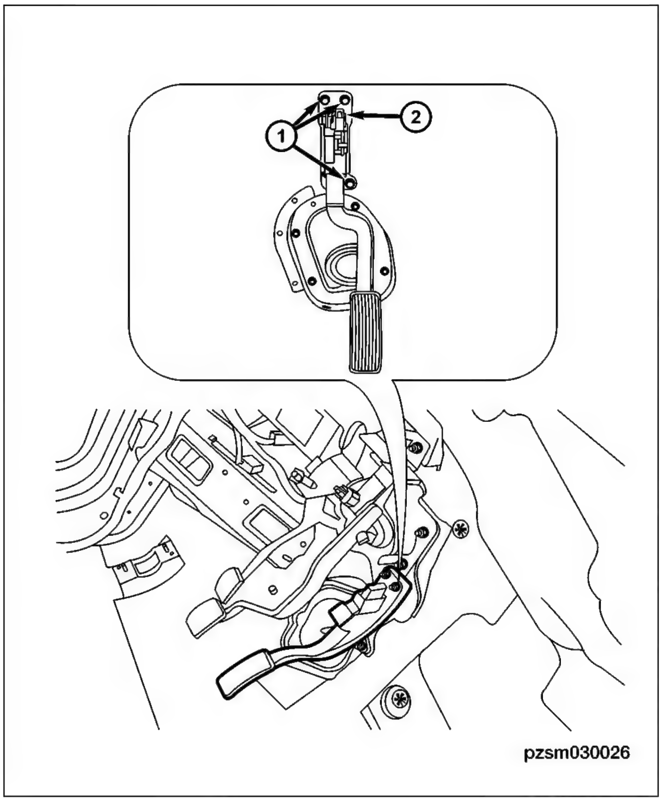
The Accelerator Pedal Position (APP) sensor is located inside the accelerator pedal. The accelerator pedal position sensor can not be serviced separately from the accelerator pedal. The accelerator pedal and the APP sensor must be replaced as a unit.

Operation

The Accelerator Pedal Position (APP) sensor in the accelerator pedal determines the opening angle of the throttle valve in the throttle body. The APP sensor is a hall sensor, and the pedal value information is sent to the Engine Control Module (ECM). The accelerator pedal position sensor is supplied with 5 volts from the ECM. As the accelerator is pressed, this produces a change in the voltage. The ECM determines the position of the throttle valve and actuates the throttle valve motor based on inputs from the APP sensor.

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the instrument panel lower trim panel.
3. Disconnect the APP sensor electrical connector (2).
4. Remove the three APP sensor mounting bolts (1). (Tighten: APP sensor mounting bolts to 11 N·m)
5. Remove the APP sensor with the pedal.



6. Installation is in the reverse order of removal.

Electronic Throttle Control Actuator

Description

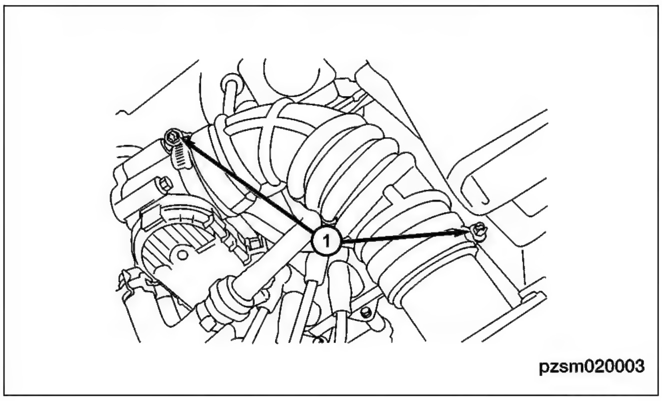
The throttle body is located on the intake manifold. It controls air into the intake manifold. The electronic throttle control actuator consists of the throttle control motor and the throttle position sensor. The throttle control motor is operated by the Engine Control Module (ECM) and it opens and closes the throttle valve. The throttle position sensor detects the throttle valve position.

Operation

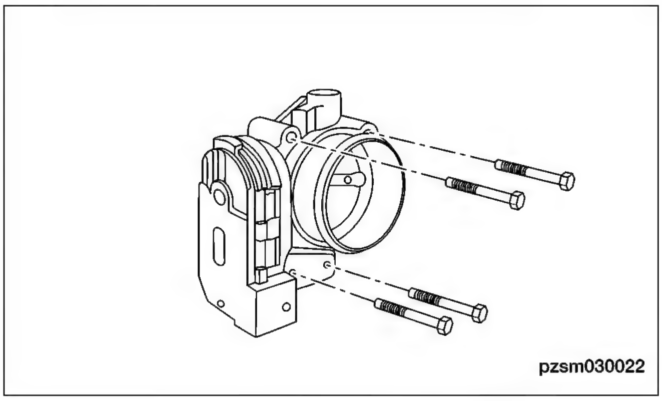
Filtered air from the air cleaner enters the intake manifold through the throttle body. A throttle valve (plate) is used to supply air for idle and all driving conditions. The throttle position sensor is part of the throttle body. The throttle position sensor signal is used by the ECM to determine throttle position. The ECM controls the electronic throttle control, which controls the amount of air entering the engine.

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the clamps (1) between the intake manifold and the air cleaner housing.



3. Disconnect the electronic throttle control actuator electrical connector.
4. Remove four electronic throttle control actuator mounting bolts.
   (Tighten: Electronic throttle control actuator bolts to 10 N·m)



5. Remove the throttle control actuator carefully.
6. Installation is in the reverse order of removal.

Engine Control Module (ECM)

Description

The Engine Control Module (ECM) is mounted to the driver side lower shroud of the instrument panel. The ECM is serviced only as a complete unit.

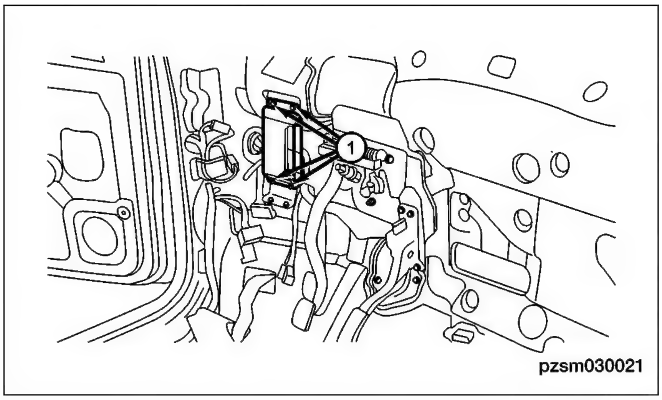
Operation

The ECM is a pre-programmed, microprocessor-based digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The ECM can adapt its programming to meet changing operating conditions.

Removal & Installation

NOTE :
The ECM is located on the driver side lower shroud of the instrument panel.

1. Disconnect the negative battery cable.
2. Remove the ECM mounting bolts (1).
   (Tighten: ECM mounting bolts to 10 N·m)
3. Disconnect the ECM electrical connector.
4. Remove the ECM.



5. Installation is in the reverse order of removal.

Installation Notes:

NOTE :
The Immobilizer control module must be matched to the new ECM before the engine will start.

Matching Immobilizer Control Module to new Engine Control Module (ECM)

Perform the following to match the Immobilizer control module to the ECM:

- With the X-431 scan tool, choose A1 series.
- Choose ″immobilize″.
- Choose ″input code″.
- Input the safety code.
- Click the small keyboard.
- Click ″OK″.
- Choose ″Immobilizer adapt″.
- Choose ″read Immobilizer to ECM″ immediately.
- Click ″OK″.

ENGINE SYMPTOM DIAGNOSIS

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Symptom Diagnostic Tests

General Troubleshooting Checks

- Confirm the engine Malfunction Indicator Light (MIL) is working properly.
- Confirm that there are no DTCs recorded with the X-431 Scan Tool.
- Confirm that the customer's complaint is current, and the conditions that are causing the failure are present.

Visual Inspection

- Check the fuel system for any fuel leakage.
- Check the vacuum system for any broken, kinked or incorrectly linked vacuum pipes or hoses.
- Check the intake air pipe for being jammed, leaking, or damaged.
- Check the ignition system for any broken or aging spark plug wires and verify the engine firing order is correct.
- Check the engine ground cable and verify a clean and tight connection.
- Check the sensors and actuators electrical connectors and verify good contact and tight connection.

NOTE :
Repair any of the above conditions first before continuing with symptom diagnostics.

Diagnostic Help

- Confirm there are no current engine DTCs.
- Confirm that the failure exists and the customer complaint can be verified.
- Inspect the engine, following the steps above and verify all engine features are operating properly.
- While servicing the vehicle, verify the service record, vehicle maintenance, engine compression pressures, mechanical ignition timing and fuel conditions.
- If replacing the Engine Control Module (ECM), carry out the validation test. If the failure no longer exists, the failure is in the ECM; if the failure still exists, reinstall the original ECM and repeat the diagnostic test.

Symptom Diagnostic Test List

SYMPTOM DEFINITION
Engine Cranks Normal But Will Not Start
Engine Will Not Crank
Hard Start / Long Crank Time
Fast Idle
Lack / Loss Of Power
Back Fires
Engine Poor Driveability
Low Idle / Stalls During Deceleration
Idle Speed Slow Return To Normal Idle

Engine Cranks Normal But Will Not Start
The following conditions apply to this symptom:

- The engine cranks at normal speed.
- The engine will not start.
- The battery is fully charged.

1. PRELIMINARY CHECKS

CAUTION:
Extended cranking because of a No Start condition can load the exhaust system with raw fuel, damaging the catalytic converter after the engine starts.

- Carry out the following preliminary checks:
  - Fuel quality
  - Electrical connections
  - Intake air tube integrity
  - Fuses and relays

Is the check result normal?

Yes >> Go to the next step.

No >> Repair as necessary.
Verify the symptom no longer exists.

2. CHECK DTC

- Turn the ignition switch on.
- With the X-431 scan tool, select view DTC.

Are there any DTCs present?

Yes >> Check for cause (See Diagnostic Trouble Code (DTC) Index).

No >> Go to the next step.

3. TRY TO START THE ENGINE WITH THE THROTTLE CLOSED

- Attempt to start the engine.

Does the engine start now with the throttle closed?

Yes >> Verify the symptom no longer exists.

No >> Go to the next step.

4. CHECK EXHAUST SYSTEM

- Inspect the vehicles exhaust system for restriction.

Is there a restriction in the exhaust system?

Yes >> Repair as necessary.

No >> Go to the next step.

5. CHECK ENGINE CYLINDER COMPRESSION

- Perform a compression test on the engine.

Is engine compression correct?

Yes >> Verify test results. If OK, see Symptom Diagnostic Tests list to repair any additional symptoms.

No >> Check for cause.

Engine Will Not Crank

The following conditions apply to this symptom:

- The engine will not crank.

1. PRELIMINARY CHECKS

- Carry out the following preliminary vehicle inspection:
  - Fuel quality
  - Battery connections
  - Starter relay connections
  - Manual transmission clutch fully depressed
  - Engine Immobilizer activated
  - Fuses/Fuse links

Is the check result normal?

Yes >> Go to the next step.

No >> Repair as necessary.
Verify the symptom no longer exists.

2. LISTEN FOR STARTER RELAY CLICKING

- Attempt to start the engine.

Is a clicking sound heard from the starter relay when the ignition key is turned to START?

Yes >> Go to the next step.

No >> Go to step 5.

3. CHECK STARTING SYSTEM

- Check the starter, starter ground, starter relay cable to starter and battery.

Is a fault indicated?

Yes >> Repair as necessary.

No >> Go to the next step.

4. CHECK OPERATION OF OTHER ELECTRICAL ACCESSORIES

- Check all accessories.

Do any other electrical accessories work?

Yes >> Go to the next step.

No >> Check the charging system.

5. CHECK DTC

- Turn the ignition switch on.
- With the X-431 scan tool, read the DTC.

Are there any DTCs present?

Yes >> Check for cause.

No >> Go to the next step.

6. CHECK STARTING SYSTEM PRIMARY CIRCUITS

- Check the starting system primary circuits as follows:
    - Starter relay
    - Ignition switch

Are components/systems OK?

Yes >> Ensure customer's concern has been resolved.

No >> Repair as necessary.

Hard Start / Long Crank / Erratic Start / Erratic Crank

The following conditions apply to this symptom:

- The engine cranks for an extended period of time.
- The engine starts hard during a long cranking time.

1. PRELIMINARY CHECKS

- Confirm that the correct starting procedure was used by the customer before proceeding with diagnosis.
- Carry out the following preliminary checks:
  - Vacuum leaks
  - Fuel quality (concerns such as correct octane, contamination, winter/summer blend)
  - Intake air system (tubes)
  - Air cleaner (restrictions)
  - Battery condition and starter current draw.

Are all checks OK?

Yes >> Go to the next step.

No >> Repair as necessary.
Verify the symptom no longer exists.

2. CHECK ECM DTC

- With the X-431 scan tool, select view DTC and data stream in ECM.

Are there any DTCs present?

Yes >> Check for cause of DTC (See Diagnostic Trouble Code (DTC) List in Section 03 Electronic Engine Controls).

No >> Go to the next step.

3. CHECK SECONDARY IGNITION SYSTEM

- Perform the following to test the secondary ignition system:
  - Disconnect the injector fuse.
  - Remove any of the 4 spark plugs.
  - Connect the spark plug to spark plug wire.
  - Ground the spark plug on the cylinder block.
  - Crank the engine to test the secondary ignition system with the spark plugs removed.

Is a strong blue spark visible at each spark plug while cranking the engine?

Yes >> Go to the next step.

No >> Check Camshaft Position (CMP) sensor signal at ECM.
If CMP sensor is OK, check the following:
- Crankshaft Position (CKP) sensor malfunction
- Faulty spark plug wires
- Faulty spark plugs

4. CHECK FUEL SYSTEM PRESSURE

- Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
- Check fuel system pressure (See Fuel Pressure Test in Section 04 Fuel Delivery).

Is fuel pressure correct?

Yes >> Go to the next step.

No >> If the fuel pressure is greater than 400 kPa (4.0 bar):
– Replace the fuel pressure regulator.
If the fuel pressure is less than 400 kPa (4.0 bar):
– Check the fuel supply system for restrictions or leaks.
– If no problems are found, repair or replace fuel filter, pressure regulator or fuel pump assembly.

5. CHECK EXHAUST SYSTEM

- Check the exhaust system for restrictions.

Is there a restriction in the exhaust system?

Yes >> Repair as necessary.

No >> Go to the next step.

6. CHECK ENGINE OVERHEATING

- Is the engine overheating (hot start concern only)?

For hot start concerns, does engine appear to be overheating?

Yes >> Repair the engine cooling system.

No >> Go to the next step.

7. CHECK POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

- Remove the PCV valve and shake it.

Does PCV valve rattle?

Yes >> Go to the next step.

No >> Replace the PCV valve.

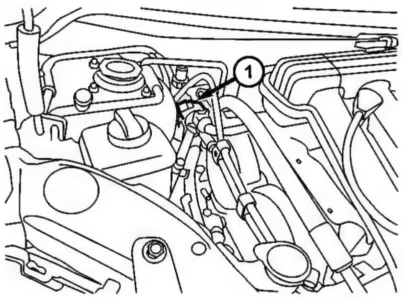
8. CHECK EVAPORATIVE EMISSIONS (EVAP) SYSTEM

- Disconnect the canister control valve (1) hose.
- Place a stiff piece of paper over the hose end and start the engine.

Does vacuum hold the paper?

Yes >> Check for a vacuum leak in the EVAP system (See Evaporative Emissions in Section 03 Electronic Engine Controls) and refer to EVAP control circuit relative to the DTC.

No >> Go to the next step.



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9. CHECK INTAKE AIR SYSTEM

- Check for MAP/MAF sensor.

Is there any contamination?

Yes >> Install a new MAF/IAT or MAP/IAT sensor.

No >> See Diagnostic Help for additional information.

Fast Idle

The following conditions apply to this symptom:

- The engine idles at a higher than recommended speed.

1. VERIFY ENGINE OPERATES AT NORMAL OPERATING TEMPERATURE

- Check the engine operating temperature.

Does the engine appear to be either overheating or not reaching normal operating temperature?

Yes >> Repair the engine cooling system.

No >> Go to the next step.

2. PRELIMINARY CHECKS

- Carry out the following preliminary checks:
  - – Vacuum leaks
  - – Throttle plate and linkage
  - – Intake air tube (leaks)
  - – Correct sealing of intake manifold and components attached to intake air tube

Are all checks OK?

Yes >> Go to the next step.

No >> Repair as necessary.
Verify the symptom no longer exists.

3. CHECK ECM DTC

- Turn the ignition switch on.
- With the X-431 scan tool, select view DTC and data stream in ECM.

Are there any DTCs present?

Yes >> Check for causes. See Diagnostic Trouble Code (DTC) index — Engine Control Module (ECM).

No >> See Diagnostic Help for additional information.

Lack / Loss Of Power
The following conditions apply to this symptom:

- The engine has poor performance.
- The engine has poor acceleration.

1. PRELIMINARY CHECKS

- Verify symptom is reported under normal driving conditions without excessive engine/vehicle load conditions.
- Carry out the following preliminary checks:
  - Fuel quality
  - Vacuum lines (check for damage and correct routing)
  - Intake air system (check for damaged tubes and dirty air filter)
  - Vehicle wiring (disconnected, corroded/damaged)
  - Throttle linkage
  - Radiator (obstructed)
  - Transaxle

NOTE :
Be aware of the over RPM limiting functions of the ECM.

Are all checks OK?

Yes >> Go to the next step.

No >> Repair as necessary.
Verify the symptom no longer exists.

2. CHECK ECM DTC

- Turn ignition switch on.
- With the X-431 scan tool, read the DTC.

Are there any DTCs present?

Yes >> Check for causes. See Diagnostic Trouble Code (DTC) index — Engine Control Module (ECM).

No >> Go to the next step.

3. CHECK FUEL SYSTEM PRESSURE

- Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
- Check fuel system pressure (See Fuel Pressure Test in Section 04 Fuel Delivery).

Is fuel pressure correct?

Yes >> Go to the next step.

No >> If the fuel pressure is greater than 400 kPa (4 bar):
– Replace the fuel pressure regulator.
If the fuel pressure is less than 400 kPa (4 bar):
– Check fuel supply system for restriction or leak.
– If no problems are found, repair or replace fuel filter, pressure regulator or fuel pump assembly.

4. CHECK SECONDARY IGNITION SYSTEM

- Perform the following to test the secondary ignition system:
  - Disconnect the injector fuse.
  - Remove any of the 4 spark plugs.
  - Connect the spark plug to spark plug wire.
  - Ground the spark plug on the cylinder block.
  - Crank the engine to test the secondary ignition system with the spark plugs removed.

Is a strong blue spark visible at each spark plug while cranking the engine?

Yes >> Go to the next step.

No >> Check Camshaft Position (CMP) sensor signal at ECM.
If CMP sensor is OK, check the following:
- Crankshaft Position (CKP) sensor malfunction
- Spark plug wires
- Spark plugs

5. CHECK INTAKE AIR SYSTEM

- Check for MAP/MAF sensor.

Is there any contamination?

Yes >> Clean or replace the sensor.

No >> Go to the next step.

6. CHECK EXHAUST SYSTEM

- Check the exhaust system for restrictions.

Is there a restriction in the exhaust system?

Yes >> Repair as necessary.

No >> Go to the next step.

7. CHECK BASE ENGINE CONCERNS

- Check for base engine concerns (such as improper compression, worn camshaft/valve train, gasket leaks).

Is a fault indicated?

Yes >> Repair as necessary.

No >> Go to the next step.

8. CHECK MANUAL TRANSAXLE OPERATION

- Check the operation of the transaxle.

Is the transaxle operation normal?

Yes >> Go to the next step.

No >> Repair as necessary.

9. CHECK FOR BRAKE SYSTEM CONCERNS

- Check the operation of the brakes.

Is a fault indicated?

Yes >> Repair as necessary.

No >> Go to the next step.

10. ADDITIONAL CHECKS

- Check the following for possible additional causes:
  - Customer driving habits (such as excessive loads or over RPM limiting functions enabled).
  - Clutch.
  - Charging system.
  - Ignition base timing (if not previously checked).
- If the base timing is not correct, align the engine timing belt (See Engine Timing Belt Removal & Installation in 02 Engine).

Are all checks OK?

Yes >> See Diagnostic Help for additional information.

No >> Repair as necessary.
Verify the symptom no longer exists.

Back Fires

The following conditions apply to this symptom:

- The engine will back fire when operated.
- The engine back fire occurs at all operating parameters.

1. PRELIMINARY CHECKS

- Carry out the following preliminary checks:
  - Vacuum lines (check for damage and correct routing).
  - Spark plug wire routing (correct firing order).

Are all checks OK?

Yes >> Go to the next step.

No >> Repair as necessary. Verify symptom no longer exists.

2. CHECK ECM DTC

- Turn the ignition switch on.
- With the X-431 scan tool, select view DTC and stream data in ECM.

Are there any DTCs present?

Yes >> Check for causes.
See Diagnostic Trouble Code (DTC) index — Engine Control Module (ECM).

No >> Go to the next step.

3. CHECK SECONDARY IGNITION SYSTEM

- Perform the following to test the secondary ignition system:
  - Disconnect the injector fuse.
  - Remove any of the 4 spark plugs.
  - Connect the spark plug to spark plug wire.
  - Ground the spark plug on the cylinder block.
  - Crank the engine to test the secondary ignition system with the spark plugs removed.

Is a strong blue spark visible at each spark plug while cranking the engine?

Yes >> Go to the next step.

No >> Check Camshaft Position (CMP) sensor signal at ECM.
If CMP sensor is OK, check the following:
- Crankshaft Position (CKP) sensor malfunction
- Spark plug wires
- Spark plugs

4. CHECK FUEL QUALITY

- Check fuel quality (concerns such as correct octane, contamination).

Is the fuel quality OK?

Yes >> Go to the next step.

No >> Repair as necessary.
Verify the symptom no longer exists.

5. CHECK KNOCK SENSOR

- Check knock sensor.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair as necessary.
Verify the symptom no longer exists.

6. CHECK TIMING

- Check the base engine timing for misalignment.

Is the check result normal?

Yes >> Go to the next step.

No >> Align the engine timing belt (See Engine Timing Belt Removal & Installation in Section 02 Engine).

7. CHECK FUEL SYSTEM PRESSURE

- Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
- Check fuel system pressure (See Fuel Pressure Test in Section 04 Fuel Delivery).

Is fuel pressure correct?

Yes >> Go to the next step.

No >> If the fuel pressure is greater than 400 kPa (4 bar):
– Replace the fuel pressure regulator.
If the fuel pressure is less than 400 kPa (4 bar):
– Check fuel supply system for restriction or leak.
– If no problems, repair or replace fuel filter, pressure regulator or fuel pump assembly.

8. CHECK FOR BASE ENGINE CONCERNS

- Check for base engine concerns (such as improper cylinder compression, worn camshaft/valve train, gasket leaks).

Is a fault indicated?

Yes >> Repair as necessary.

No >> See Diagnostic Help for additional information.

Engine Poor Driveability

The following conditions apply to this symptom:

- Engine stalls/quits, engine runs rough, misses, buck/jerk, hesitation/stumble acceleration, surges, rolling idle.
- Engine stops unexpectedly at beginning of acceleration or during acceleration.
- Engine stops unexpectedly while cruising.
- Engine speed fluctuates during acceleration.
- Engine misses during acceleration.
- Vehicle bucks/jerks during acceleration, cruising or deceleration.
- Momentary pause during acceleration.
- Momentary minor loss in engine output.

1. PRELIMINARY CHECKS

NOTE :
Be aware of the over RPM limiting functions of the ECM.

- Carry out the following preliminary checks:
  - Fuel quality
  - Vacuum lines (check for damage and correct routing)
  - Intake air system (check for damaged tubes and dirty air filter)
  - Vehicle wiring (disconnected, corroded/damaged)
  - Throttle linkage.
  - Radiator (obstructed)
  - Transaxle

Are all checks OK?

Yes >> Go to the next step.

No >> Repair as necessary. Verify symptom no longer exists.

2. CHECK FOR STALL AT IDLE

- Check for engine stall at idle.

NOTE :
Confirm that proper vehicle maintenance has been performed before continuing with engine diagnosis.

- Inspect the following components:
  - Clean the injectors
  - Fuel filter
  - Intake air filter
  - Throttle body
  - Spark plugs
  - Spark plug wires

Does the engine now stall at idle?

Yes >> Repair as necessary.

No >> Go to the next step.

3. CHECK FOR ROUGH IDLE

- Check for engine rough idle.

NOTE :
Confirm that proper vehicle maintenance has been performed before continuing with engine diagnosis.

- Inspect the following components:
  - Clean the carbon deposit on intake and exhaust valves
  - Valve stem
  - Spark plugs
  - Throttle body
  - Spark plugs and combustion chamber

Does the engine idle rough?

Yes >> Repair as necessary.

No >> Go to the next step.

4. CHECK ECM DTC

- Turn the ignition switch on.
- With the X-431 scan tool, read the DTC.

Are there any DTCs present?

Yes >> Repair as necessary.

No >> Go to the next step.

5. CHECK THE ELECTRONIC THROTTLE CONTROL (ETC) ACTUATOR

- Start engine and let idle.
- While checking for RPM drop or engine stall, disconnect ETC actuator connector.

Did RPM drop or engine stall when the ETC connector was disconnected?

Yes >> Connect ETC actuator connector.
Go to the next step.

No >> Repair as necessary.

6. CHECK SECONDARY IGNITION SYSTEM

- Perform the following to test the secondary ignition system:
  - Disconnect the injector fuse.
  - Remove any of the 4 spark plugs.
  - Connect the spark plug to spark plug wire.
  - Ground the spark plug on the cylinder block.
  - Crank the engine to test the secondary ignition system with the spark plugs removed.

Is a strong blue spark visible at each spark plug while cranking the engine?

Yes >> Go to the next step.

No >> Check Camshaft Position (CMP) sensor signal at ECM.
If CMP sensor is OK, check the following:
– Crankshaft Position (CKP) sensor malfunction
– Spark plug wires
– Spark plugs

7. CHECK FUEL SYSTEM PRESSURE

- Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
- Check fuel system pressure (See Fuel Pressure Test in Section 04 Fuel Delivery).

Is fuel pressure correct?

Yes >> Go to the next step.

No >> If the fuel pressure is greater than 400 kPa (4 bar):
– Replace the fuel pressure regulator.
If the fuel pressure is less than 400 kPa (4 bar):
– Check fuel supply system for restriction or leak.
– If no problems, repair or replace fuel filter, pressure regulator or fuel pump assembly.

8. CHECK EXHAUST SYSTEM

- Check the exhaust system for restrictions.

Is there a restriction in the exhaust system?

Yes >> Repair as necessary.

No >> Go to the next step.

9. CHECK PCV SYSTEM

- Check the Positive Crankcase Ventilation (PCV) system.
- Remove PCV valve and shake it.

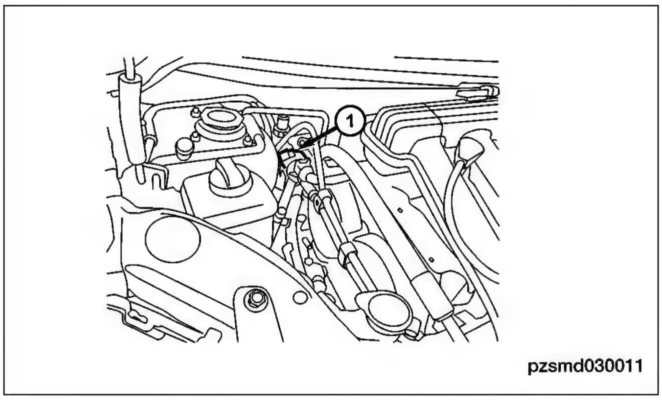
Is PCV valve normal?

Yes >> Go to the next step.

No >> Replace the PCV valve.

10. CHECK EVAPORATIVE EMISSIONS (EVAP) SYSTEM

- Disconnect the canister control valve (1) hose.
- Place a stiff piece of paper over the hose end, start engine.



Does vacuum hold the paper?

Yes >> Check for a vacuum leak in the EVAP system (See Evaporative Emissions in Section 03 Electronic Engine Controls) and refer to EVAP control circuit relative to the DTC.

No >> Go to the next step.

11. CHECK ENGINE CYLINDER COMPRESSION

- Check engine cylinder compression.
- Compression should not be less than 1,000 kPa, and not vary more than 25 percent from cylinder to cylinder.

Is engine compression correct?

Yes >> Go to the next step.

No >> Repair as necessary.

12. ADDITIONAL CHECKS

- Check the following for possible additional causes:
  - Driveline
  - Transaxle
  - Charging system
  - A/C system (for surge with A/C on)

Are the checks OK?

Yes >> See Diagnostic Help for additional information.

No >> Repair as necessary.

Low Idle / Stalls During Deceleration
The following conditions apply to this symptom:

- Engine stops unexpectedly at beginning of deceleration or recovery from deceleration.

1. PRELIMINARY CHECKS

- Carry out the following preliminary checks:
  - Vacuum lines (routing, leaks)
  - Intake air tubes
  - Wiring connections

Are all checks OK?

Yes >> Go to the next step.

No >> Repair as necessary.
Verify the symptom no longer exists.

2. CHECK FOR ROUGH OR STALL AT IDLE

- Check for rough idle or stall at idle.

NOTE :
Confirm that proper vehicle maintenance has been performed before continuing with engine diagnosis.

- Inspect the following components:
  - Clean the carbon deposit on intake and exhaust valves
  - Valve stem
  - Spark plugs and combustion chamber

Does the engine idle rough?

Yes >> Repair as necessary.

No >> Go to the next step.

3. CHECK ECM DTC

- Turn the ignition switch on.
- With the X-431 scan tool, read the DTC.

Are there any DTCs present?

Yes >> Repair as necessary.

No >> Go to the next step.

4. CHECK THE ELECTRONIC THROTTLE CONTROL (ETC) ACTUATOR

- Start engine and let idle.
- Disconnect the ETC actuator connector and check for RPM drop or engine stall.

Did RPM drop or engine stall when the ETC connector was disconnected?

Yes >> Connect ETC actuator connector.
Go to the next step.

No >> Repair as necessary.

5. CHECK CLUTCH OPERATION CONDITION.

- Check clutch operation condition.

Is the transaxle clutch operation normal?

Yes >> Go to the next step.

No >> Repair as necessary.

6. CHECK A/C SYSTEM OPERATION

- Start engine.
- Cycle A/C switch from on to off (verify A/C clutch engages condition).
- Check the A/C system operation.

Does the A/C system operate normally?

Yes >> Go to the next step.

No >> Repair as necessary.

7. CHECK FUEL SYSTEM PRESSURE

- Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
- Check fuel system pressure (See Fuel Pressure Test in Section 04 Fuel Delivery).

Is fuel pressure correct?

Yes >> Go to the next step.

No >> If the fuel pressure is greater than 400 kPa (4 bar):
– Replace the fuel pressure regulator.
If the fuel pressure is less than 400 kPa (4 bar):
– Check fuel supply system for restriction or leak.
– If no problems, repair or replace fuel filter, pressure regulator or fuel pump assembly.

8. CHECK FOR BASE ENGINE CONCERNS

- Check for base engine concerns (such as improper compression, worn camshaft/valve train, gasket leaks).

Is a fault indicated?

Yes >> Repair as necessary.

No >> See Diagnostic Help for additional information.

Idle Speed Slow Return To Normal Idle

The following conditions apply to this symptom:

- Slow return to idle.

1. PRELIMINARY CHECKS

- Carry out the following preliminary checks:
  - Vacuum leaks
  - Intake air system
  - Throttle body

Are all checks OK?

Yes >> Go to the next step.

No >> Repair as necessary.
Verify the symptom no longer exists.

2. CHECK ECM DTC

- Turn the ignition switch on.
- With the X-431 scan tool, read the DTC.

Are there any DTCs present?

Yes >> Repair as necessary.

No >> Go to the next step.

3. CHECK PCV VALVE

- Remove Positive Crankcase Ventilation (PCV) valve and shake it.

Does PCV valve rattle?

Yes >> Install PCV valve, go to the next step.

No >> Replace the PCV valve.

4. CHECK PCV SYSTEM

- Start engine and bring to normal operating temperature.
- Disconnect the crankcase ventilation hose from PCV valve.
- Place a stiff piece of paper over the hose.
- Wait 1 minute.

Does vacuum hold paper in place?

Yes >> Verify test results. If OK, see Symptom Diagnostic Tests list to repair any additional symptoms.

No >> Check for vacuum leaks, obstructions in the PCV system, oil cap, PCV valve, rocker cover bolt torque/gasket leak. Repair as necessary.

IGNITION CONTROL

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GENERAL INFORMATION

Description

The electronic ignition system consists of the following components:
- Engine Control Module (ECM)
- Ignition Coil
- Spark Plugs
- Spark Plug Wires
- Camshaft Position (CMP) Sensor
- Crankshaft Position (CKP) Sensor

Operation

The ignition system utilizes a split ignition coil which supplies secondary voltage to two cylinders. When the ignition coil discharges, two spark plugs fire at the same time. The Engine Control Module (ECM) uses inputs from the Crankshaft Position (CKP) Sensor to determine the Top Dead Center (TDC) position of the piston for cylinder number one, and the Camshaft Position (CMP) Sensor to determine which ignition coil to energize.

Specifications

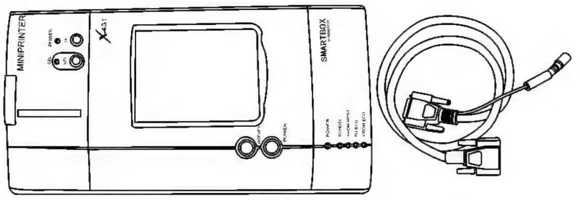
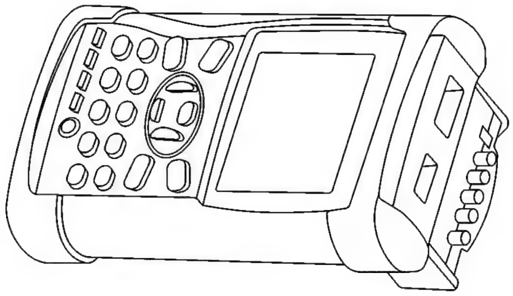
Torque Specifications

DESCRIPTION	TORQUE (N·m)
Spark Plugs	30
Ignition Coil Bolts	6

Spark Plug Specifications

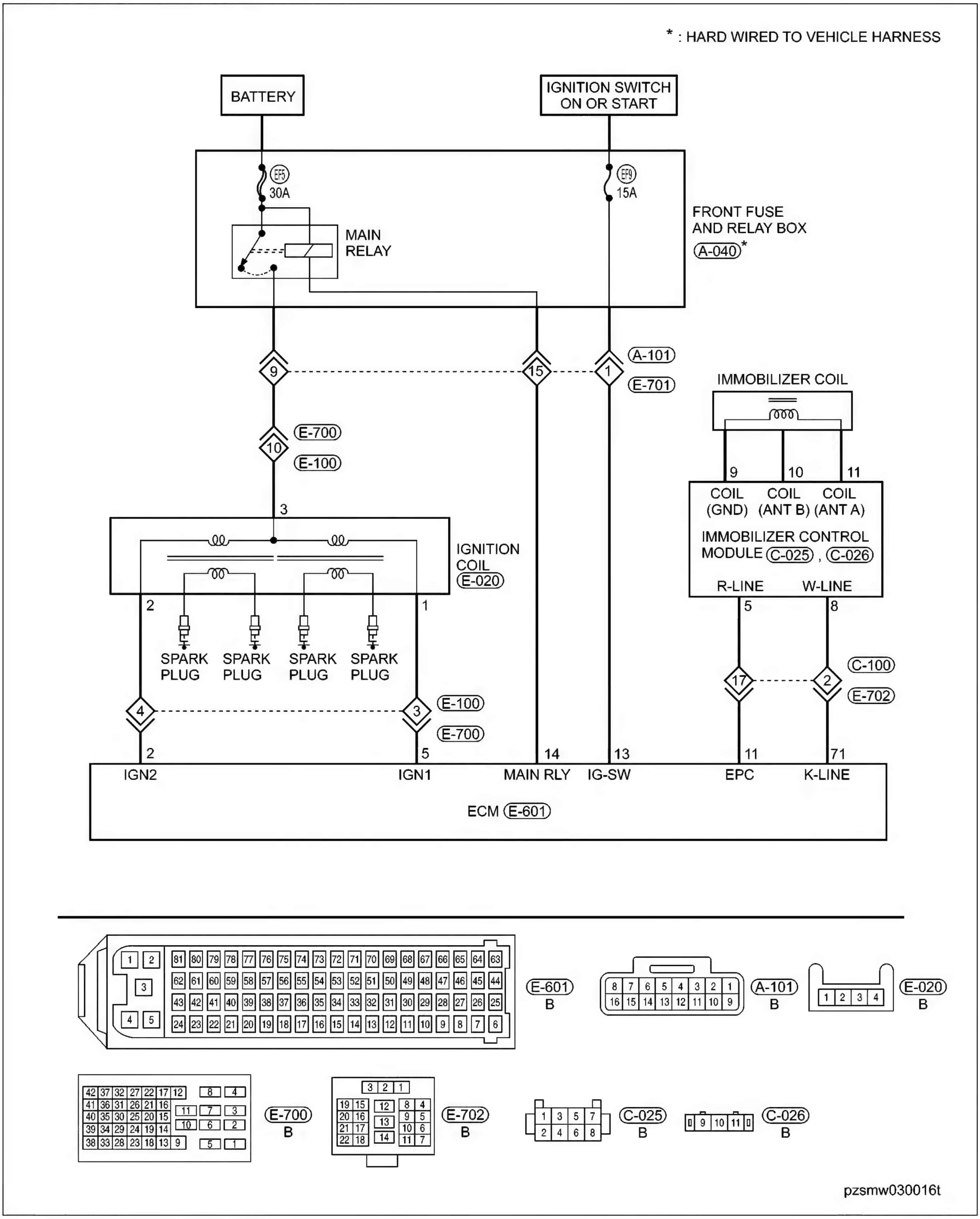
DESCRIPTION	SPARK PLUG GAP (mm)
FR7DTC	0.7 - 1.1

Special Tools

Diagnostic Scan Tool X-431	 MINIPRINTER X431 SMARTBOX besm030001
Engine Analyzer KES-200	 ltsmd030069

Electrical Schematics

Ignition Control System (Page 1 of 1)


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5 30A
EF9 15A
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
A-101
E-701
9
15
1
E-700
E-100
10
3
IGNITION COIL
E-020
2
1
SPARK PLUG
SPARK PLUG
SPARK PLUG
SPARK PLUG
4
3
E-100
E-700
IMMOBILIZER COIL
9
10
11
COIL (GND)
COIL (ANT B)
COIL (ANT A)
IMMOBILIZER CONTROL MODULE C-025, C-026
R-LINE
W-LINE
5
8
17
2
C-100
E-702
2
5
14
13
11
71
IGN2
IGN1
MAIN RLY
IG-SW
EPC
K-LINE
ECM E-601
E-601 B
A-101 B
E-020 B
E-700 B
E-702 B
C-025 B
C-026 B
pzsmw030016t

ON-VEHICLE SERVICE

Ignition Coil

Description

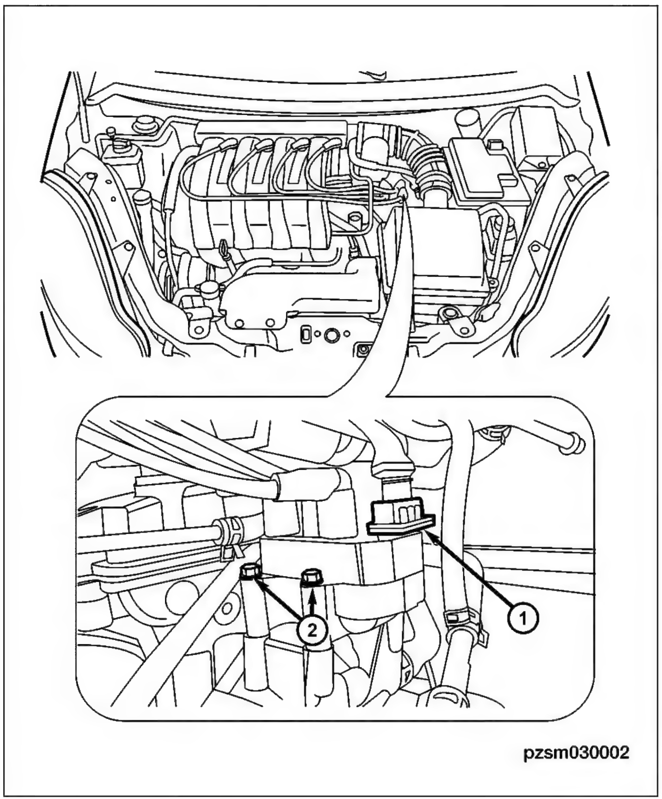
The ignition coil consists of a primary and secondary winding of wire. The primary winding is located on one end of the coil. The secondary winding connects to two spark plugs. The secondary windings form a loop and provide high-voltage output.

Operation

One end of the primary wire is connected to battery power and the other end is connected to the Engine Control Module (ECM). When the primary wire is connected to battery power, current will flow causing a strong magnetic field to form. When the primary wire is disconnected, the magnetic field will collapse into the secondary winding causing a very high voltage output.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the ignition coil electrical connector (1).
3. Twist the spark plug wires from the ignition coil and remove the four spark plug wires.
4. Remove the 4 ignition coil retaining bolts (2). (Tighten: Ignition coil retaining bolts to 6 N·m)

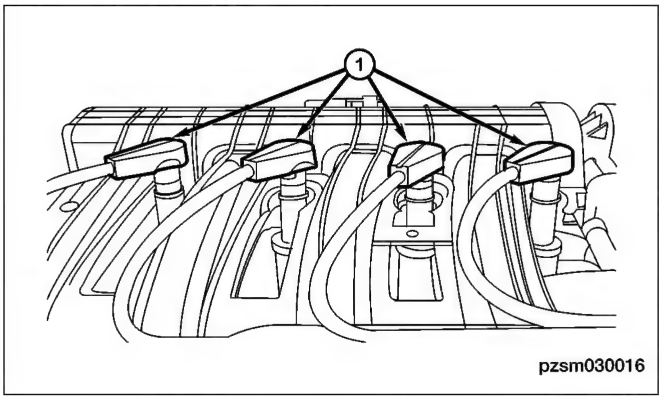


5. Remove the ignition coil.
6. Installation is in the reverse order of removal.

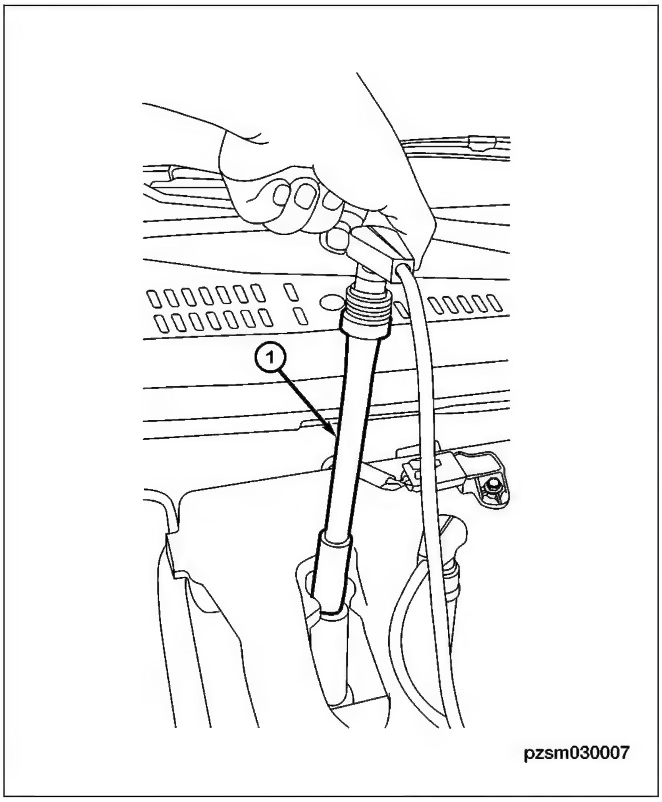
Spark Plug Wire

Removal & Installation

1. Disconnect the negative battery cable.
2. Twist the spark plug wire from the ignition coil and remove the spark plug wire.
3. Twist the spark plug wire (1) from the spark plug, then pull the spark plug wire straight up away from the engine.



4. Remove the spark plug wires (1).



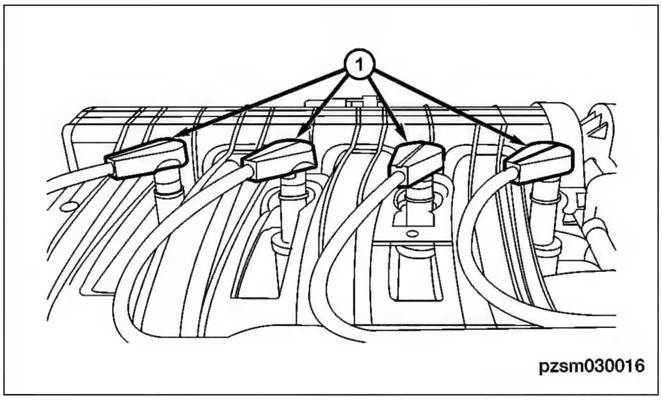
Cylinder Number	1	2	3	4
Length (mm)	690	525	450	380
Resistance (kΩ/m)	16 ± 20%	16 ± 20%	16 ± 20%	16 ± 20%
Diameter (mm)	7	7	7	7

5. Installation is in the reverse order of removal.

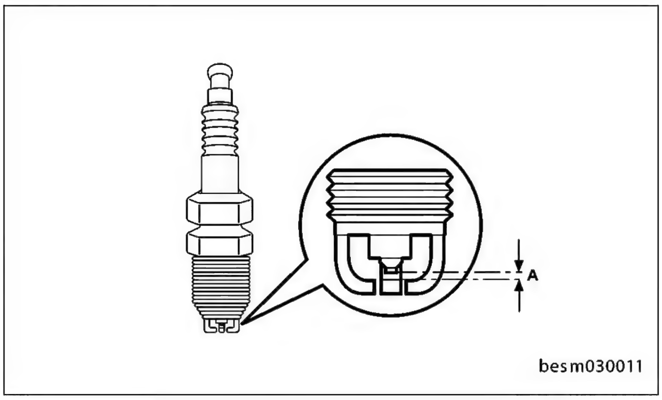
Spark Plug

Removal & Installation

1. Disconnect the negative battery cable.
2. Twist the spark plug wire (1) from spark plug then pull the spark plug wire straight up away from the engine.



3. Remove the spark plug.
   (Tighten: Spark plug to 30 N·m)
4. Inspect the spark plug condition.
5. Installation is in the reverse order of removal.



Installation Notes:

- Verify the proper spark plug gap before installing spark plugs.
  - Spark Plug Gap (A): 0.7-1.0 mm

EVAPORATIVE EMISSIONS

GENERAL INFORMATION 03-208
Description 03-208
Operation 03-208
Specifications 03-208
Special Tools 03-209
Electrical Schematics 03-210

ON-VEHICLE SERVICE 03-211

Vapor Canister Control Valve 03-211
Description 03-211
Operation 03-211
Removal & Installation 03-211

Vapor Canister 03-212
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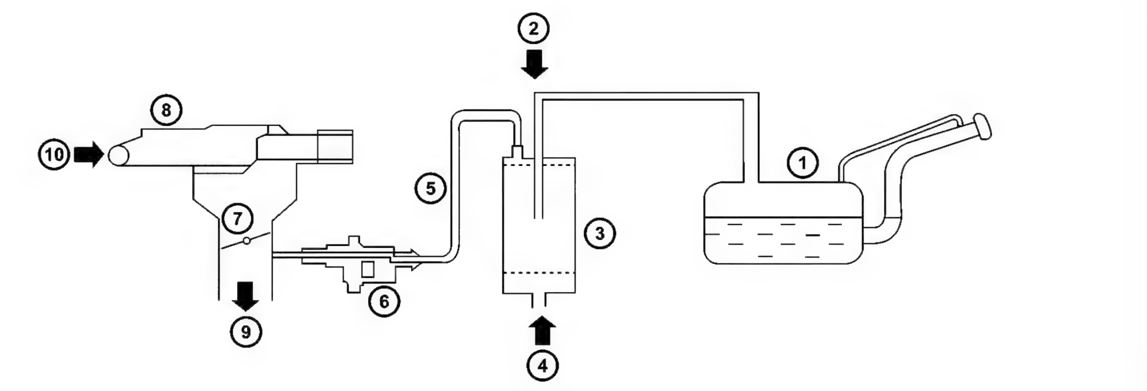
Operation 03-212
Diagnosis & Testing 03-212
Removal & Installation 03-212

GENERAL INFORMATION

Description

The evaporation control system prevents the emission of fuel tank vapors into the atmosphere. When fuel evaporates in the fuel tank, the vapors pass through vent hoses or tubes to an activated carbon filled vapor canister. The vapor canister temporarily holds the fuel vapors. The Engine Control Module (ECM) allows intake manifold vacuum to draw fuel vapors into the engine to be burned during certain operating conditions.

Operation



besm030026

1 - Fuel Tank	6 - Vapor Canister Control Valve
2 - Fuel Vapor	7 - Throttle Valve
3 - Vapor Canister	8 - Air Filter Assembly
4 - Vapor Canister Vent	9 - To Engine
5 - Hose	10 - Air Intake

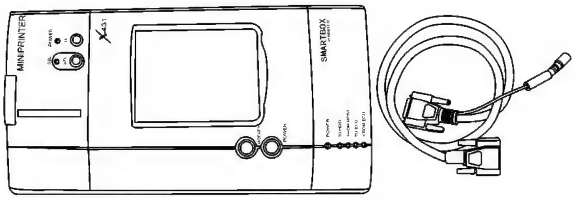
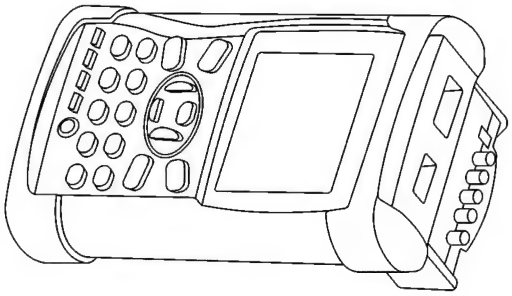
The ECM will only energize the vapor canister control valve solenoid when the engine is at operating temperature, but will de-energize it during periods of deceleration. When de-energized, no vapors are purged. The pulse-width modulated canister control valve modulates the fuel vapor purge rate from the vapor canister and fuel tank to the engine intake manifold.

Specifications

Torque Specifications

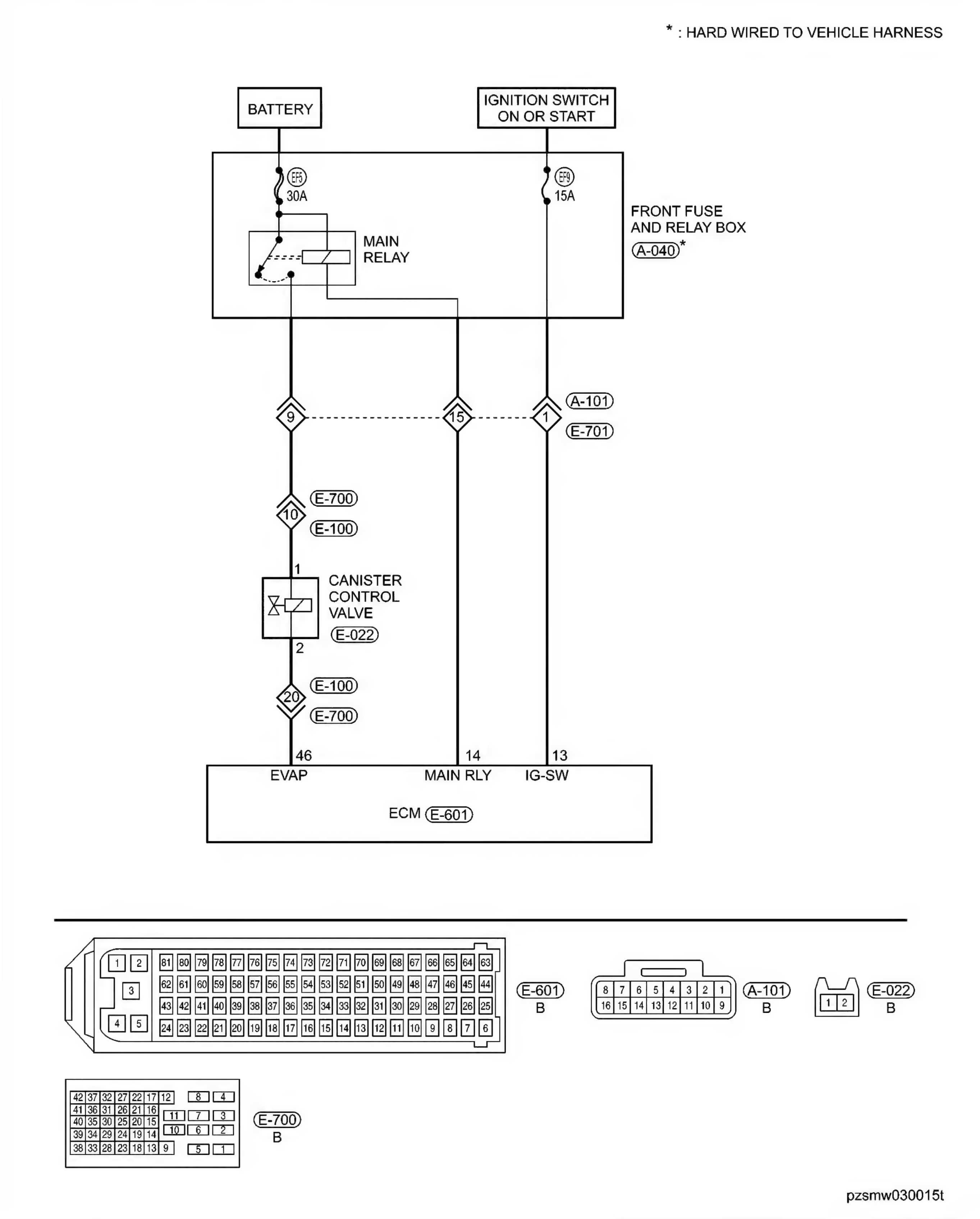
DESCRIPTION	TORQUE (N·m)
Vapor Canister Bolts	10

Special Tools

Diagnostic Scan Tool X-431	 MINIPRINTER SMARTBOX besm030001
Engine Analyzer KES-200	 ltsmd030069

Electrical Schematics

Canister Control Valve (Page 1 of 1)


* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF5
30A
EF9
15A
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
9
15
1
A-101
E-701
E-700
10
E-100
1
CANISTER CONTROL VALVE
E-022
2
E-100
20
E-700
46
14
13
EVAP
MAIN RLY
IG-SW
ECM E-601
E-601
B
A-101
B
E-022
B
E-700
B
pzsmw030015t

ON-VEHICLE SERVICE

Vapor Canister Control Valve

Description

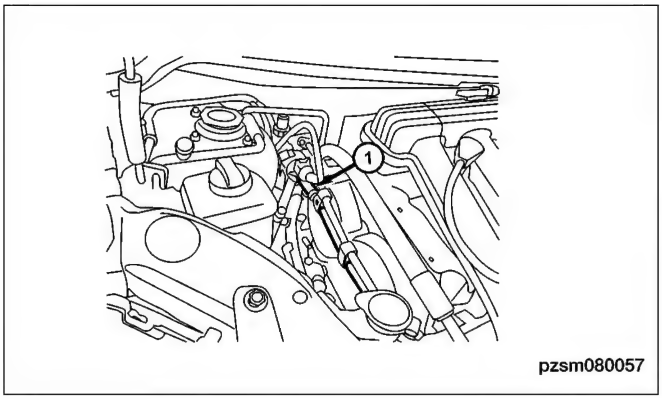
The vapor canister control valve is installed near of the engine air filter. The vapor canister control valve is pulse-width modulated. The vapor canister control valve regulates the rate of vapor flow from the vapor canister to the throttle body.

Operation

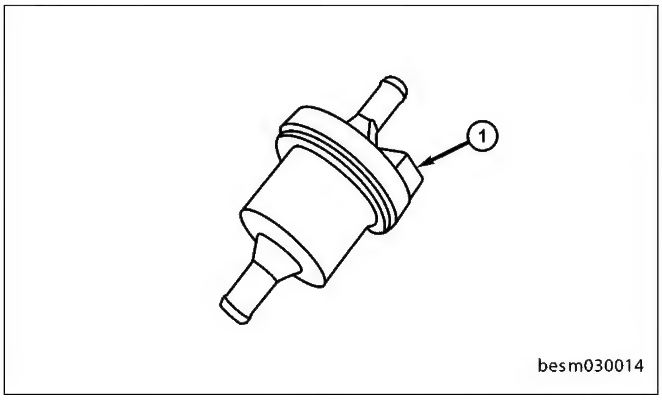
The Engine Control Module (ECM) controls the opening and closing of the canister control valve. When the Main Relay is energized, the vapor canister control valve switches from closed to open. The ECM controls the frequency at which the vapor canister control valve operates in order to accommodate the vapor volume for each cylinder.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the vapor canister control valve electrical connector.
3. Disconnect the lines (1) from vapor canister control valve.



4. Remove the vapor canister control valve (1) from the bracket.
5. Installation is in the reverse order of removal.



Vapor Canister

Description

The vapor canister is located in the right rear of the vehicle, beside the right rear wheel.

Operation

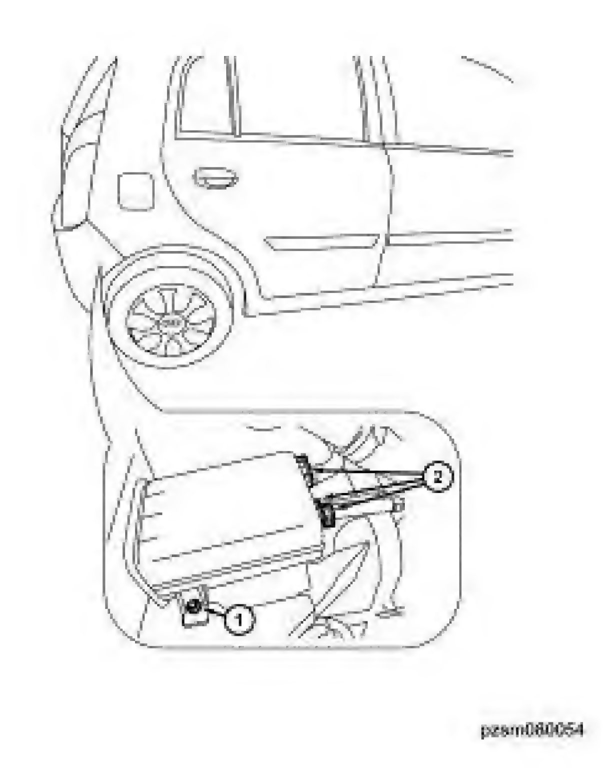
This vehicle uses a vapor canister filled with activated carbon granules. Fuel tank vapors are vented into the canister where they are absorbed by the activated carbon granules. The canister temporarily holds the fuel vapors until intake manifold vacuum draws them into the intake manifold. The Engine Control Module (ECM) purges the canister through the pulse-width modulated vapor canister control valve. The ECM purges the canister at predetermined intervals and engine conditions.

Diagnosis & Testing

1. Disconnect the air intake hose and plug the air intake hole.
2. Apply air pressure into the fuel stream intake hose.
3. Verify the air can flow freely through the hose.
4. Make sure the vapor canister is not be plugged or leaking.

Removal & Installation

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove the three hose clamps (2) at the vapor canister.
4. Remove the vapor canister retaining bolts (1). (Tighten: Vapor canister retaining bolts to 10 N·m)
5. Remove the vapor canister.
6. Installation is in the reverse order of removal.



FUEL DELIVERY
04

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- **Fuel Tank** 04-18
  - Description 04-18
  - Operation 04-18
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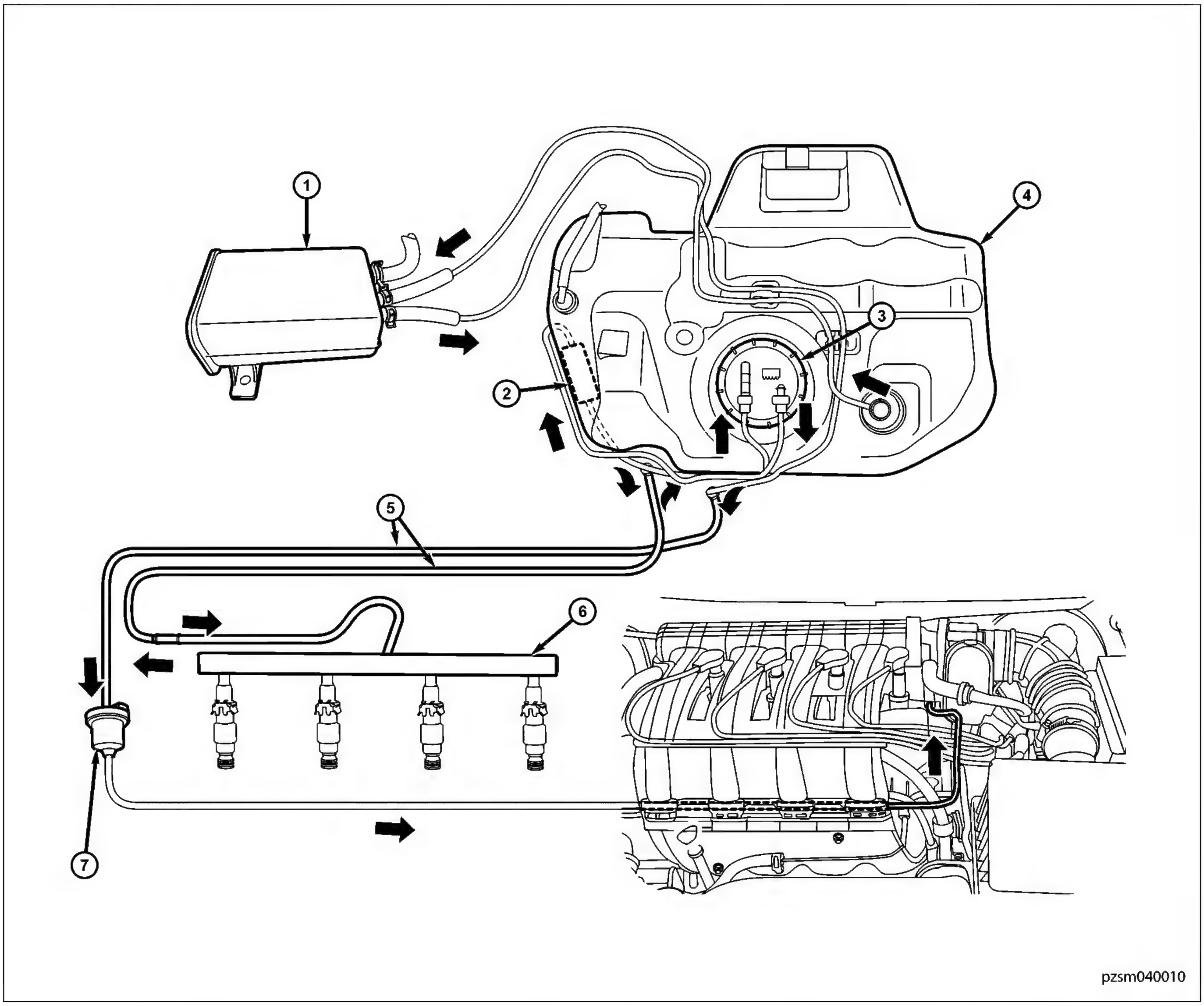
GENERAL INFORMATION

Description



1 - EVAP Canister	5 - Fuel Lines
2 - Fuel Filter	6 - Fuel Rail and Fuel Injectors
3 - Fuel Pump	7 - EVAP Canister Purge Solenoid
4 - Fuel Tank	

The fuel system consists of a fuel tank with a reservoir, fuel pump, fuel filter, fuel line, fuel rail, fuel injectors. The Engine Control Module (ECM) controls the fuel system based on signal inputs. The Immobilizer control module signals the ECM to activate the fuel system. If the ECM does not receive the proper signal from the Immobilizer control module, the ECM will not allow the fuel system to operate.

- The ACTECO engine utilizes a returnless fuel delivery system.

WARNING!

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

Operation

The fuel pump and fuel delivery system are activated under the following conditions:

- With the ignition switch ON (engine off), the fuel delivery system is enabled for 3-6 seconds.
- When the Engine Control Module (ECM) receives a Crankshaft Position (CKP) sensor signal.

The fuel injectors are a solenoid-operated valve that meter fuel flow to each cylinder. The fuel injectors are opened and closed constantly during engine operation. The amount of fuel is controlled by the length of time the fuel injector is held open. The fuel injectors are powered by a 12 V source and are controlled through the ground side of the circuit by the ECM.

The fuel pump operation is defined in the fuel system control strategy and is controlled by the ECM.

Specifications

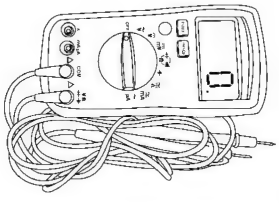
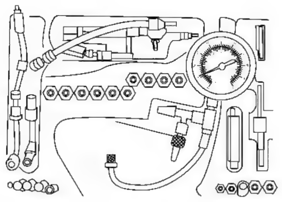
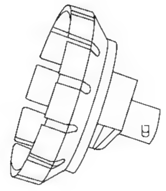
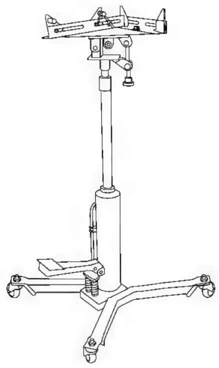
Torque Specifications

DESCRIPTION	TORQUE (N·m)
Fuel Rail Bracket Bolts	11
Fuel Pump Mounting Nuts	2

Fuel Pressure Specifications

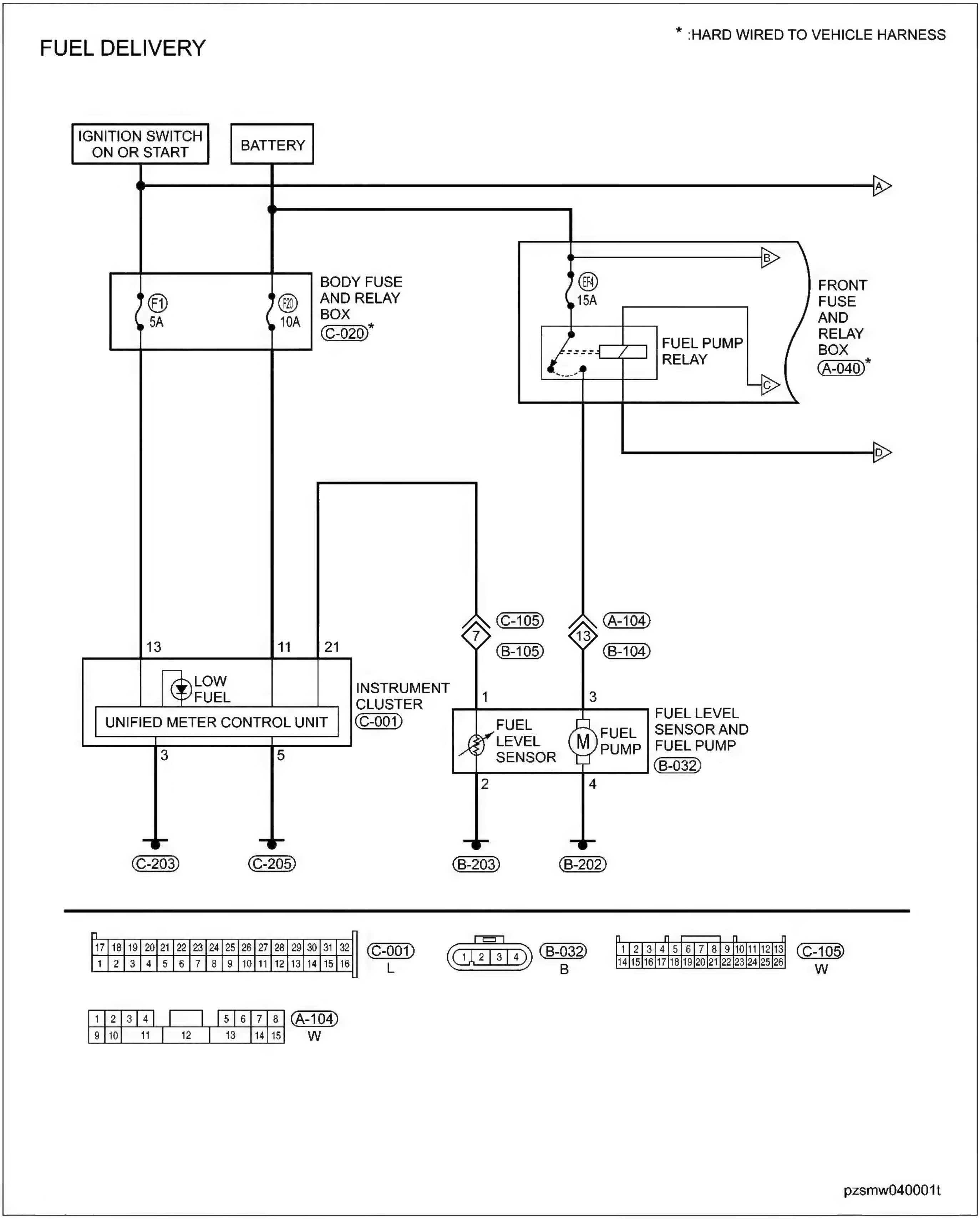
DESCRIPTION	PRESSURE
Fuel Pressure at Fuel Rail - Key On	350 kPa (3.5 bar)
Fuel Pressure at Fuel Rail - Key Off	330 kPa (3.3 bar) in 10 minutes
Fuel Pressure at Fuel Rail - Engine Idle	350 kPa (3.5 bar) - 370 kPa (3.7 bar)

Special Tools

Digital Multimeter Fluke 15B & 17B	 besm030002
Fuel Pressure Gauge	 besm030008
Fuel Pump Remover CH-20032	 ltsm040011
Service Jack	 vism040010

Electrical Schematics

Fuel Delivery System (Page 1 of 4)


FUEL DELIVERY
* :HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BATTERY
A
B
C
D
BODY FUSE AND RELAY BOX
C-020*
F1
5A
F20
10A
EF4
15A
FUEL PUMP RELAY
FRONT FUSE AND RELAY BOX
A-040*
13
11
21
LOW FUEL
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
3
5
C-105
7
B-105
A-104
13
B-104
1
3
FUEL LEVEL SENSOR
M
FUEL PUMP
FUEL LEVEL SENSOR AND FUEL PUMP
B-032
2
4
C-203
C-205
B-203
B-202
C-001
L
B-032
B
C-105
W
A-104
W
pzsmw040001t

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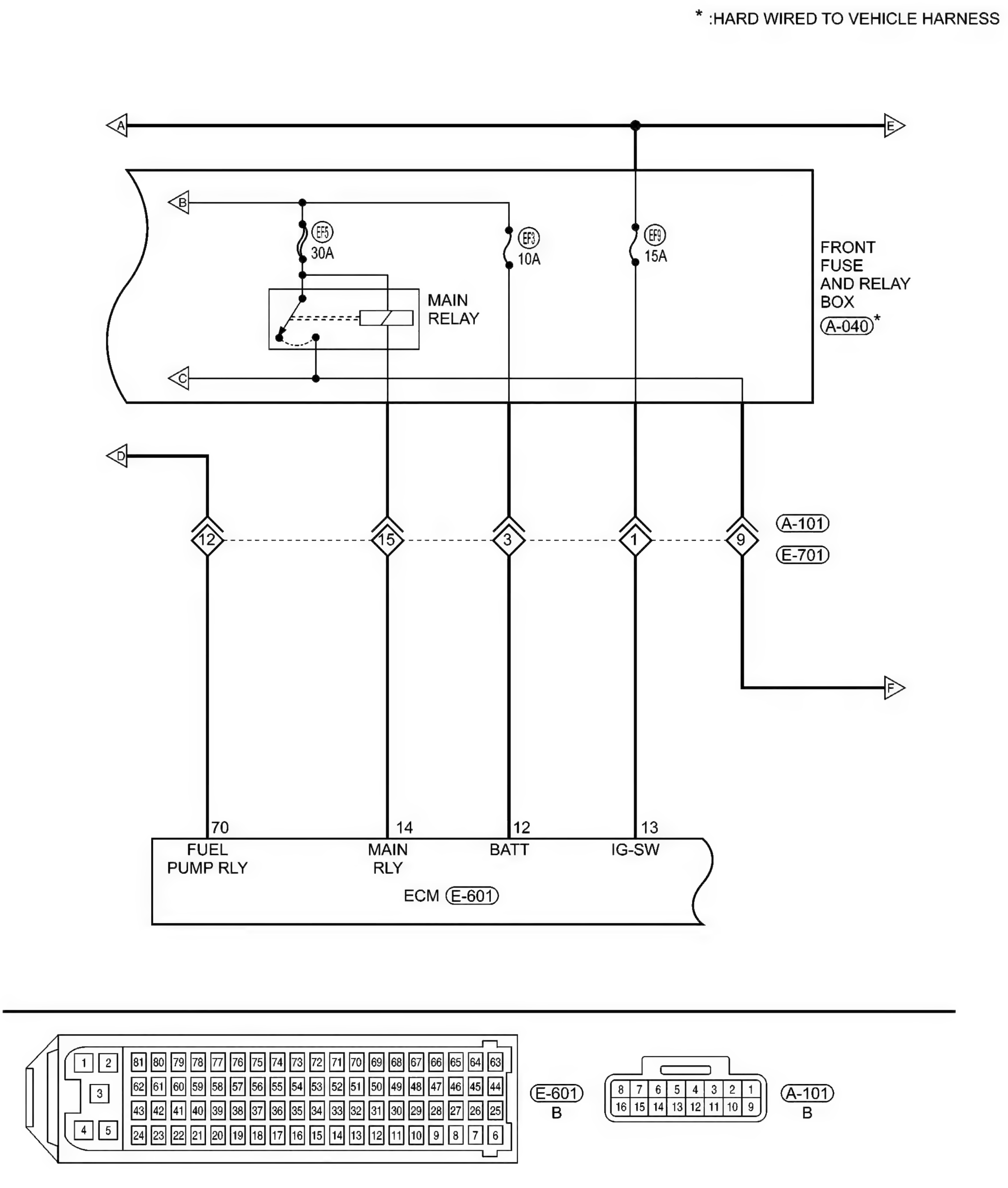
* :HARD WIRED TO VEHICLE HARNESS
A
E
B
EF5
30A
EF3
10A
EF9
15A
MAIN
RELAY
C
FRONT
FUSE
AND RELAY
BOX
A-040*
D
12
15
3
1
9
A-101
E-701
F
70
FUEL
PUMP RLY
14
MAIN
RLY
12
BATT
13
IG-SW
ECM E-601
E-601
B
A-101
B
pzsmw040002t

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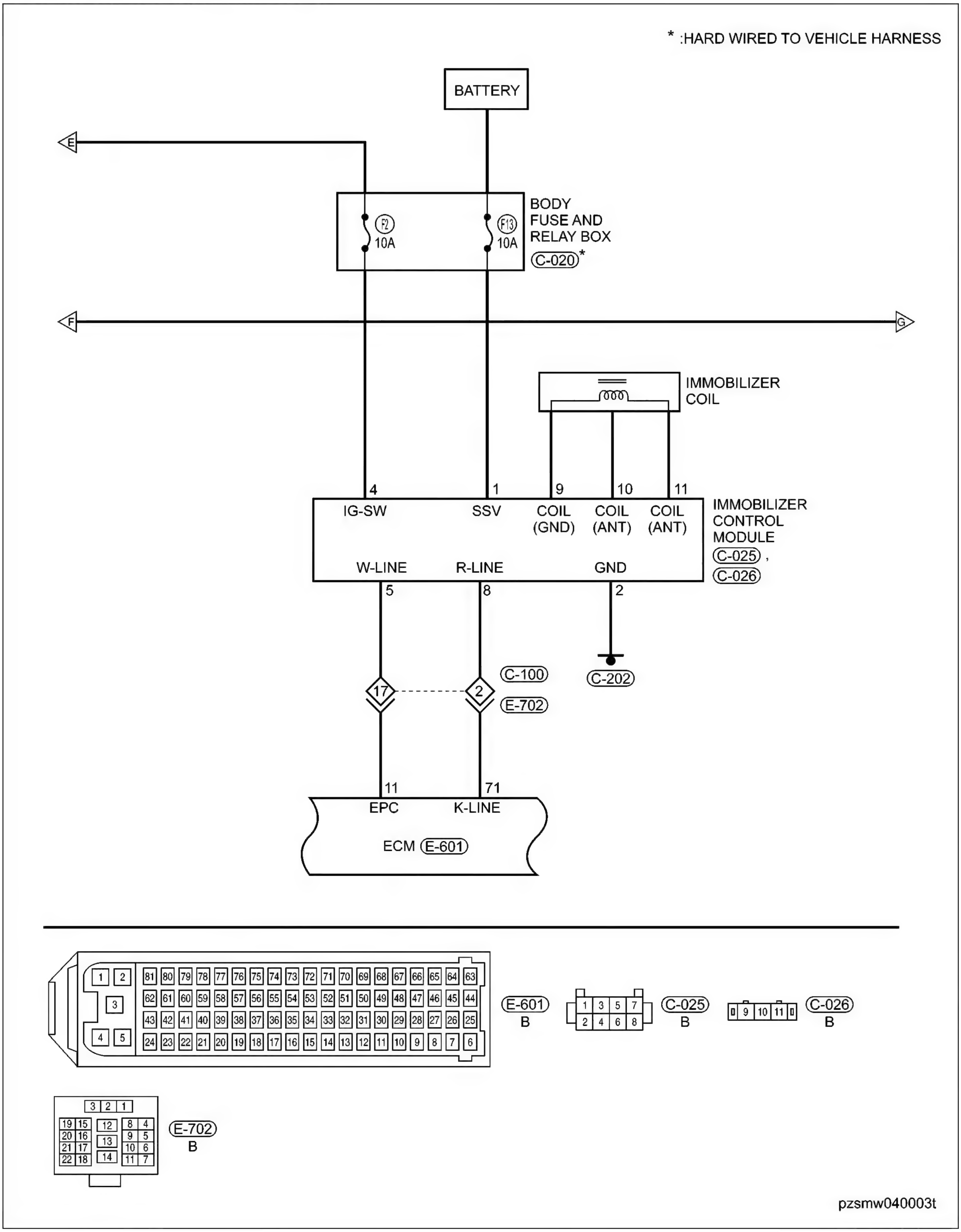
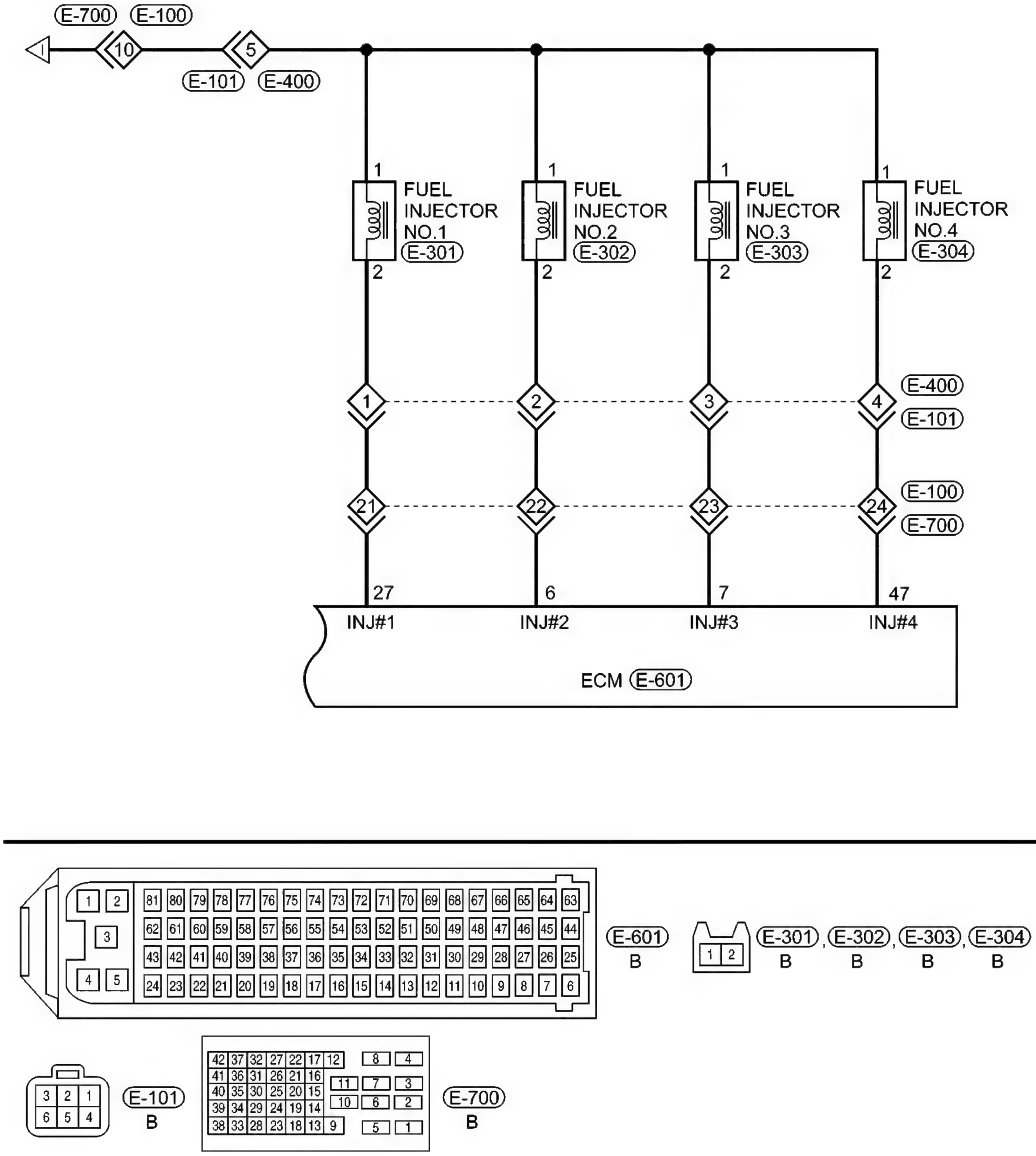

* :HARD WIRED TO VEHICLE HARNESS
BATTERY
E
F2
10A
F13
10A
BODY
FUSE AND
RELAY BOX
C-020*
F
G
IMMOBILIZER
COIL
4
1
9
10
11
IG-SW
SSV
COIL (GND)
COIL (ANT)
COIL (ANT)
IMMOBILIZER
CONTROL
MODULE
C-025,
C-026
W-LINE
R-LINE
GND
5
8
2
17
2
C-100
E-702
C-202
11
71
EPC
K-LINE
ECM E-601
E-601
B
C-025
B
C-026
B
E-702
B
pzsmw040003t

Fuel Delivery System (Page 4 of 4)


E-700
E-100
I
10
5
E-101
E-400
1
FUEL INJECTOR NO.1
E-301
2
1
FUEL INJECTOR NO.2
E-302
2
1
FUEL INJECTOR NO.3
E-303
2
1
FUEL INJECTOR NO.4
E-304
2
1
2
3
4
E-400
E-101
21
22
23
24
E-100
E-700
27
6
7
47
INJ#1
INJ#2
INJ#3
INJ#4
ECM
E-601
E-601
B
E-301, E-302, E-303, E-304
B
B
B
B
E-101
B
E-700
B

pzsmw040004t

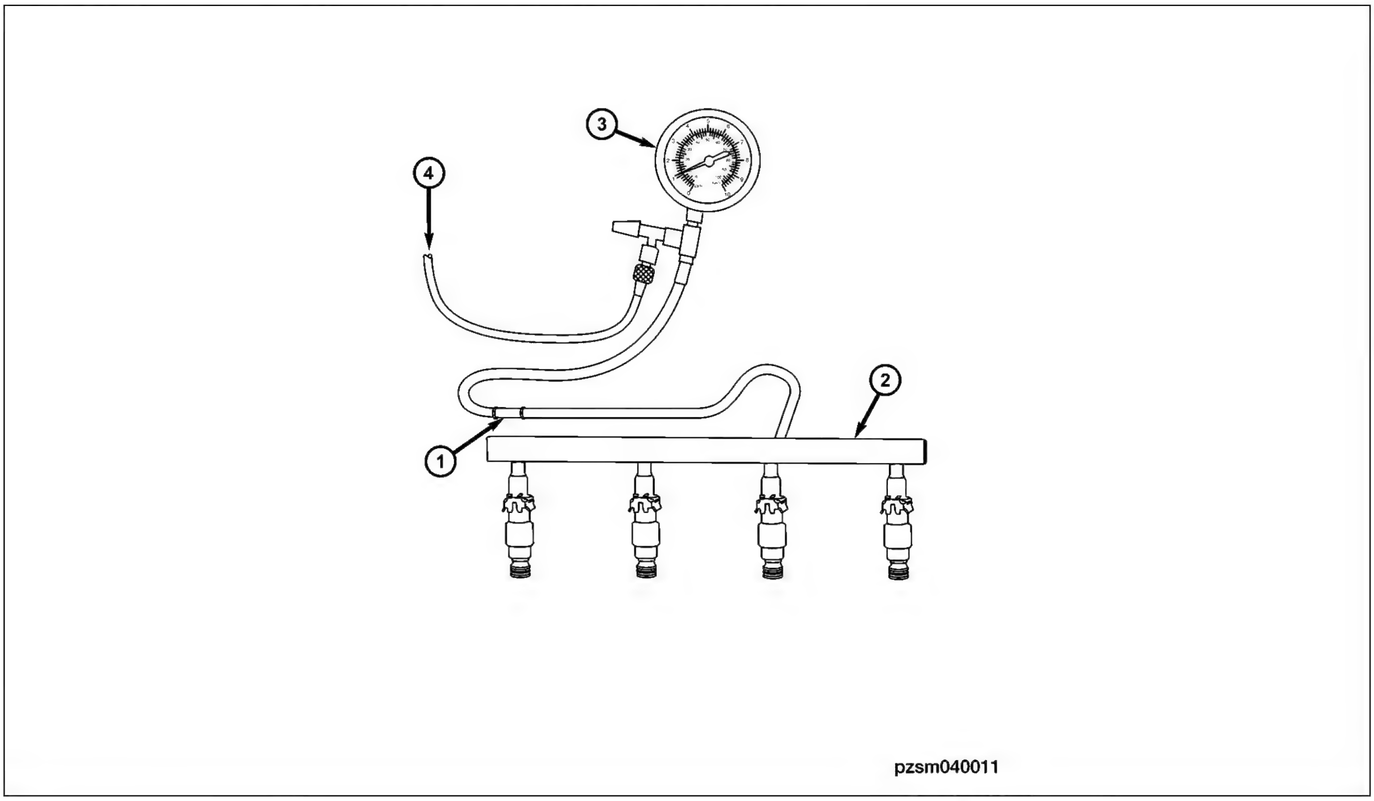
DIAGNOSIS & TESTING

Fuel Pressure Test

WARNING!

Fuel in the fuel system remains under high pressure, even when the engine is not running. Before servicing or disconnecting any of the fuel lines or fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery). Failure to follow these instructions may result in serious personal injury.

Perform the following procedure to test for proper fuel pressure.



pzsm040011

WARNING!

Wrap towels around the fuel lines to catch any gasoline spillage.

1. Connect one end of the fuel pressure gauge (3) to the inlet fuel line (4) and connect the other end of the fuel pressure gauge (3) to the fuel rail inlet (1).
2. Start and warm the engine and note pressure gauge reading. Fuel pressure should be 350 kPa (3.5 bar) at idle.
3. If engine runs, but pressure is below 350 kPa (3.5 bar), check the following:
   a. Check for a kinked fuel supply line between the fuel rail and the fuel pump, repair if necessary.
   b. Check the fuel filter for blockage, and replace the fuel filter if necessary (See Fuel Filter Removal & Installation in Section 04 Fuel Delivery).
   c. Check the fuel pump, and replace if necessary (See Fuel Pump Removal & Installation in Section 04 Fuel Delivery).
4. If operating pressure is above 350 kPa (3.5 bar), the fuel pump is OK, but the fuel pressure regulator is defective. Replace the fuel pump (See Fuel Pump Removal & Installation in Section 04 Fuel Delivery).

   NOTE: The fuel pressure regulator is integrated into the fuel pump assembly and is not serviced separately.

Observe the following fuel pressures when testing:

FUEL PRESSURE	
Key On	350 kPa (3.5 bar)
Key Off	330 kPa (3.3 bar) in 10 minutes
Engine Idle	350 kPa (3.5 bar) - 370 kPa (3.7 bar)

Fuel System Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
No Start/Hard Start/Start and then Stall	· Contaminated fuel · Low fuel pressure · Restricted fuel filter · Fuel pump relay inoperative · Restricted or leaking fuel lines · Fuel pressure regulator	· Drain, flush and refill fuel system. · Check fuel pump pressure. · Replace fuel filter. · Test fuel pump relay. · Inspect/replace necessary fuel line(s), perform fuel system air purge. · Inspect/replace the fuel pump if necessary.
Stalls Under Aggressive Maneuvers/ Loss Of Fuel Pressure	· Restricted or damaged fuel filter · Contaminated fuel · Damaged fuel tank	· Replace fuel filter. · Drain, flush and refill fuel system. · Replace fuel tank.
Cannot Refill Fuel Tank/Excessive Pressure in Fuel Tank When Cap is Removed	· Sticking or damaged fuel tank fill/vent valve, hose or lines.	· Inspect, repair vent hose and lines, replace fuel tank.

Fuel Pump Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Symptoms of a Defective Fuel Pump	· Noisy operation · Poor acceleration · Failure to start (starting difficulties)	· Replace the fuel pump
Reasons For Fuel Pump Failure	· Accumulated contaminants causing an insulation layer · Fuel pump bushing and armature blocked · Eroded fuel level sensor components	· Replace the fuel pump

Fuel Injector Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Symptoms of a Defective Fuel Injector(s)	· Poor idling · Poor acceleration · Failure to start (starting difficulties)	· Replace the fuel injector(s)
Reasons For Fuel Injector Failure	· An accumulation of contaminants inside the injector due to lack of maintenance	· Clean injectors regularly with an approved method

ON-VEHICLE SERVICE

Fuel Pressure Relief Procedure

Relieving Fuel System Pressure

WARNING!

Fuel in the fuel system remains under high pressure, even when the engine is not running. Before servicing or disconnecting any of the fuel lines or fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel. Failure to follow these instructions may result in serious personal injury.

Perform the following procedure to relieve fuel pressure from the fuel system:

1. Remove the cover of the front fuse and relay box.
2. Identify and remove the fuel pump relay from the front fuse and relay box.
3. Start and run engine until it stalls.
4. Attempt to restart engine until it will no longer run.
5. Turn the ignition key to OFF position.

NOTE :
Reinstall the fuel pump relay when the fuel system service is complete.

Fuel Pump

Description

The fuel pump assembly contains the fuel pump motor, fuel level sensor and fuel pressure regulator.

Operation

The Engine Control Module (ECM) activates the fuel pump relay for several seconds after the ignition switch is turned ON. When the relay is activated, it provides voltage to the fuel pump. When the ECM receives an engine speed signal from the Crankshaft Position (CKP) sensor and a signal from the Immobilizer control module, the ECM will energize the fuel pump relay.

NOTE :

- The electric fuel pump has different flow ratings based on engine requirements
- For service, the part number of the replacement fuel pump must be the equivalent of the original fuel pump
- Do not operate the fuel pump dry, this will damage the fuel pump
- Keep the fuel tank and pipeline clean, and replace the fuel filter if the fuel pump is replaced

Removal & Installation

WARNING!

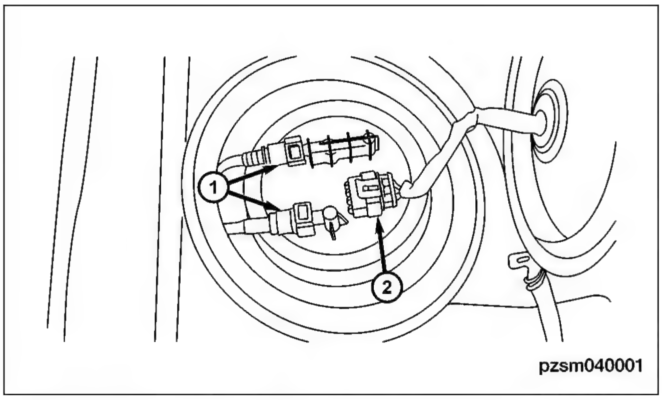
Release fuel system pressure before servicing fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

NOTE :
The following special tool is required to perform the repair procedure:

- CH-20032 - Fuel Pump Remover

1. Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
2. Remove the negative battery cable.
3. Remove the rear seat cushion (See Rear Seat Removal & Installation in Section 15 Body & Accessories).
4. Remove the fuel pump cover.

5. Disconnect the two fuel lines (1) and the fuel pump connector (2).



6. Using special tool CH-20032, remove the fuel pump mounting cover.
7. Pry the fuel pump up and out of the fuel tank.

WARNING!

Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

NOTE :

When removing the fuel pump, use caution not to spill fuel inside of the vehicle.

8. Tip the fuel pump on its side and drain the fuel from the fuel pump and remove the fuel pump from the vehicle.
9. Cover the opening in the fuel tank while the fuel pump is removed.
   CAUTION: To avoid foreign material from being dropped into the tank, cover the tank opening while the fuel pump is removed.
10. Remove and discard the fuel pump seal from the fuel tank.
11. Installation is in the reverse order of removal.

Installation Notes:

- Use caution when unpacking the new fuel pump and do not unwrap the pump until it is ready to be installed.
- When installing the fuel pump, install a new filter screen to the fuel pump inlet. The filter screen size should not exceed 60 microns.
- Never operate the fuel pump without the filter screen installed. Foreign material that enters the fuel pump inlet of the fuel pump or the filter screen may lead to damage of the fuel pump.
- Handle the fuel pump carefully and be sure to protect the filter screen from damage.
- Install a new seal to the fuel pump sealing surface.
- Turn the ignition switch to ON (without starting the engine) to apply fuel pressure to the fuel system, then check the fuel line connections for fuel leaks.
- Start the engine and let it idle and check for fuel leaks at the fuel system connections.

Fuel Pump Inspection

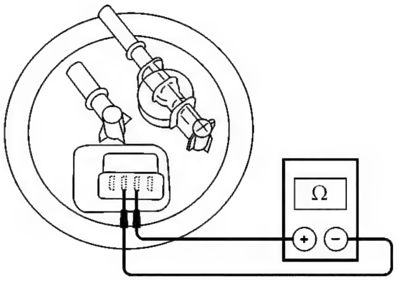
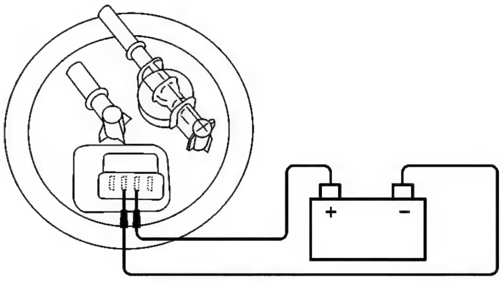
NOTE :
The fuel pump must be removed before performing the following inspection procedure.

CAUTION:
These tests must be completed within 10 seconds to prevent the coil from burning out.

WARNING!

- **Keep the fuel pump as far away from the battery as possible.**
- **Always switch the voltage on and off on the battery side, not on the fuel pump side.**

1. Check the fuel pump resistance:
   - Use the following table to test fuel pump resistance.
   - Connect a digital multimeter to terminals 2 and 3.
   - If the result is not as specified, replace the fuel pump.
2. Check the fuel pump operation:
   - Use the following table to test fuel pump operation.
   - Apply battery voltage to terminals 2 and 3. Check that the pump operates within 10 seconds.
   - If the pump does not operate, replace the fuel pump.

MEASURING CONDITION	SPECIFICATION	INSPECTION DIAGRAM
Digital multimeter positive (+) probe to terminal – 2 Digital multimeter negative (-) probe to terminal – 3	< 130 Ω	 ltsm040012
Battery positive (+) to terminal – 2 Battery negative (-) to terminal – 3	8 - 16 V	 ltsm040013

Fuel Filter

Description

The fuel filter consists of a housing with an integrated filter element.

Operation

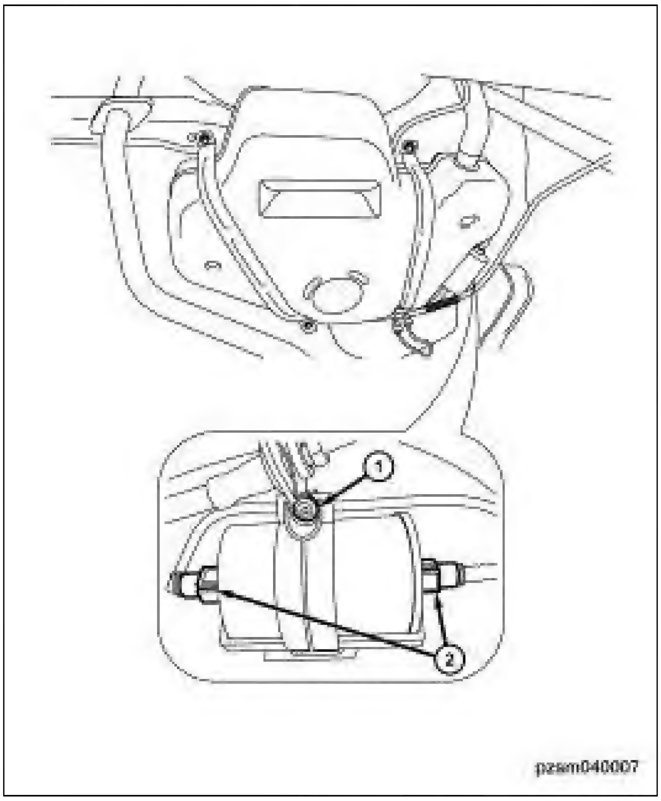
The fuel flows through the filter from the outside to the inside. As a result, any impurities are trapped inside the filter.

Removal & Installation

WARNING!

Release fuel system pressure before servicing fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

1. Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
2. Disconnect the negative battery cable.
3. Remove the fuel lines (1) and fuel filter retaining screw (2).



4. Remove the fuel filter.
5. Installation is in the reverse order of removal.

Installation Notes:

- Verify there are NO leaks at the fuel line connections of the fuel filter.

Fuel Injector Rail

Description

The fuel rail is used to mount the fuel injectors to the engine and it is mounted to the intake manifold.

Operation

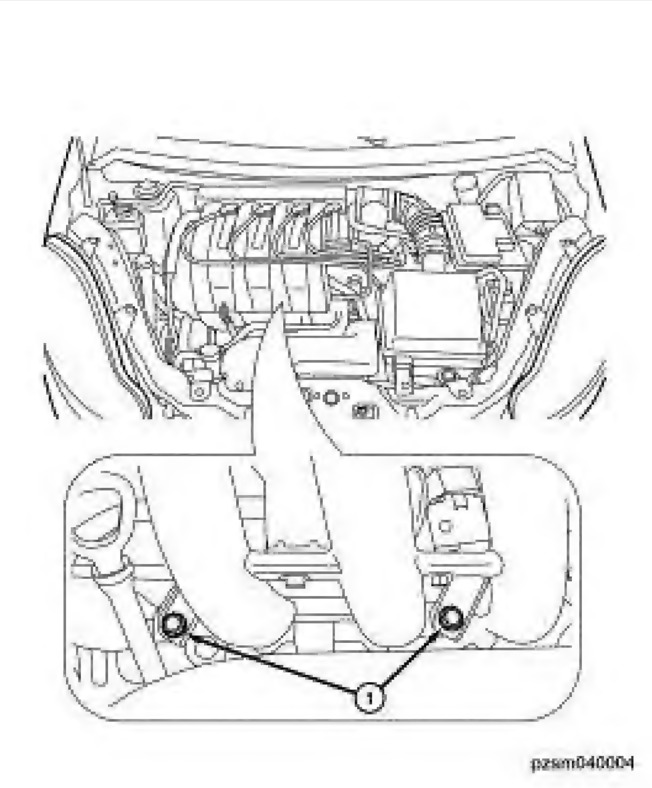
The fuel rail supplies the necessary fuel to each individual fuel injector and is located above the intake manifold and fuel injectors.

Removal & Installation

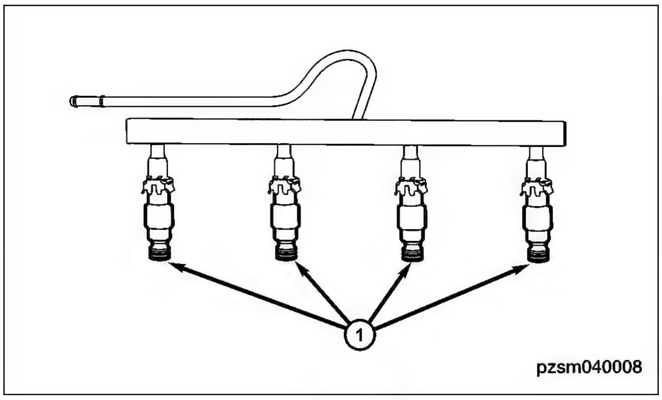
WARNING!

Release fuel system pressure before servicing fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

1. Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
2. Disconnect the negative battery cable.
3. Remove the intake manifold (See Intake Manifold Removal & Installation in Section 02 Engine).
4. Disconnect the electrical connectors from the fuel injectors.
5. Remove the fuel line from the fuel rail.
6. Remove the two fuel rail bracket bolts (1).
   (Tighten: Fuel rail bracket bolts to 11 N·m)



7. Remove the fuel rail with the four fuel injectors (1).



8. Installation is in the reverse order of removal.

Installation Notes:

- Install new O-ring seals on the fuel injector sealing surfaces.

Fuel Injector

Description

The fuel injectors are positioned in the intake manifold with the nozzle ends directly above the intake valve port.

Operation

Injector operation is controlled by a ground path provided for each injector by the Engine Control Module (ECM). Injector on-time (pulse-width) is variable, and is determined by the ECM. Based on the engine operating conditions, the ECM will control injector pulse-width operation to obtain optimum performance.

NOTE :

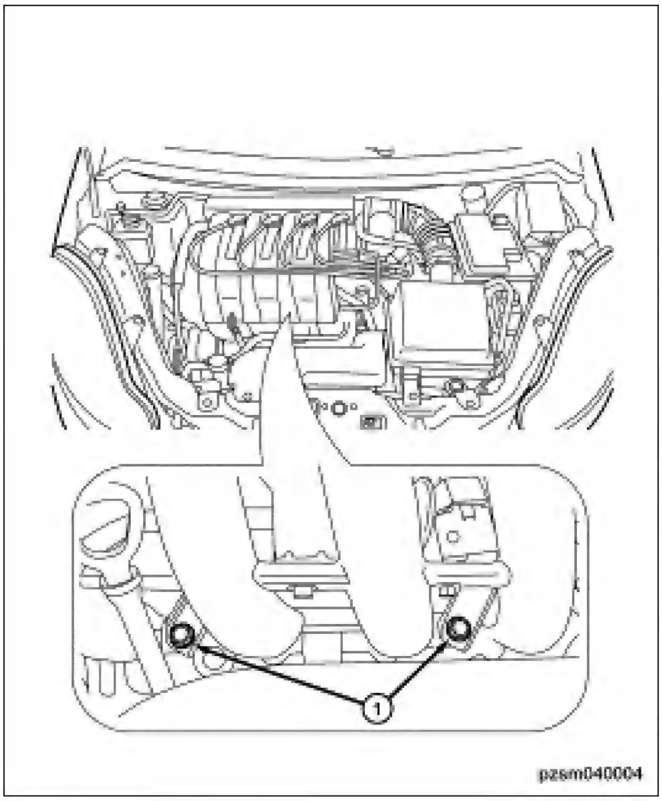
- Clean injectors regularly with an approved method.

Removal & Installation

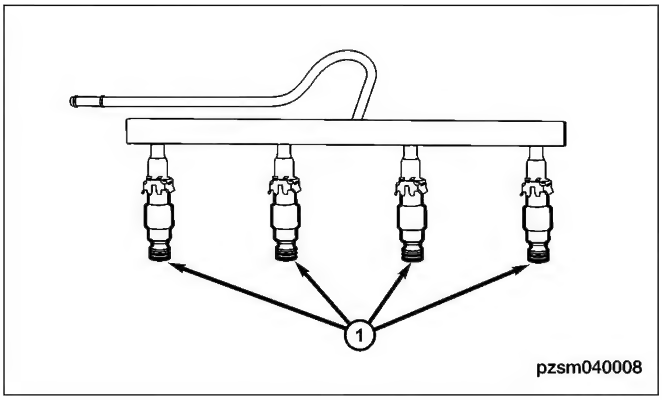
WARNING!
Release fuel system pressure before servicing fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

1. Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
2. Disconnect the negative battery cable.
3. Disconnect the electrical connectors from the fuel injectors.
4. Remove the intake manifold (See Intake Manifold Removal & Installation in Section 02 Engine).
5. Remove the fuel line from the fuel rail.

6. Remove the two fuel rail bracket bolts (1). (Tighten: Fuel rail bracket bolts to 11 N·m)



7. Remove the fuel rail with the four fuel injectors (1).



8. Remove the clip holding the fuel injector to the fuel rail.
9. Remove the fuel injector from the fuel rail.
10. Installation is in the reverse order of removal.

Installation Notes:

- Install new O-ring seals on the fuel injector sealing surfaces.
- To ease the installation of the fuel injectors, use a small amount of engine oil between the injectors and the fuel rail.
- Use care to match the correct fuel injector with the correct fuel injector electrical connector when reconnecting the fuel injector electrical connectors.
- Place each fuel injector in the injector bracket vertically, then attach the injector to the bracket with the retaining clips.

Fuel Injector Inspection

1. Remove the fuel injector electrical connector.
2. Use a digital multimeter to measure the resistance between the two fuel injector pins (fuel injector side).

SPECIFICATION	TEMPERATURE
11 - 16 Ω	20°C

Fuel Tank

Description

The fuel tank is constructed of a plastic composite material. The fuel tank stores fuel and the fuel pump module is mounted in the fuel tank.

Operation

The fuel tank is used for fuel storage. The fuel pump is mounted in the fuel tank and delivers fuel from the tank to the entire fuel system.

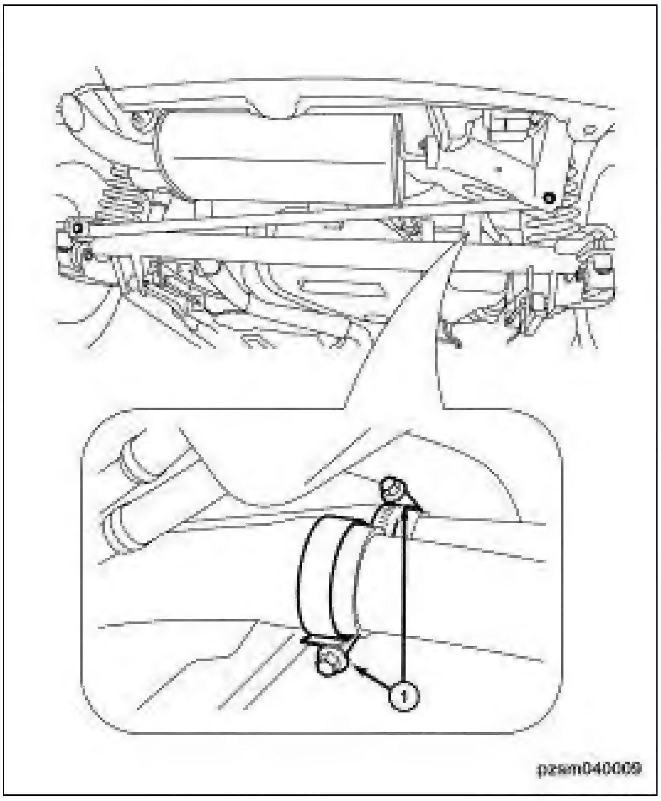
Removal & Installation

WARNING!

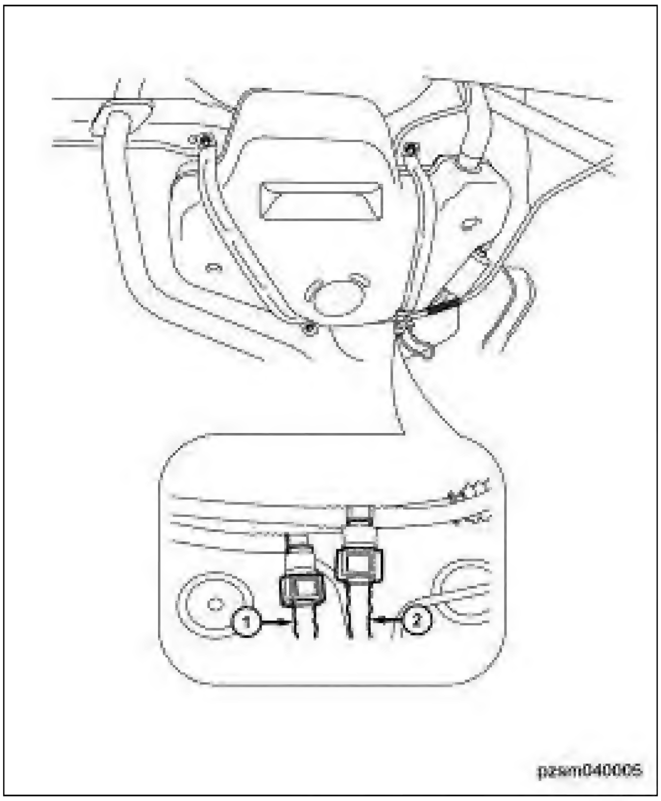
Release the fuel system pressure before servicing any fuel system components. Service vehicles in well ventilated areas and avoid ignition sources. Never smoke while servicing the vehicle. This may result in personal injury or death.

1. Release the fuel system pressure (See Fuel Pressure Relief Procedure in Section 04 Fuel Delivery).
2. Remove the negative battery cable.
3. Remove the rear seat cushion (See Rear Seat Removal & Installation in Section 15 Body & Accessories).
4. Remove the fuel pump (See Fuel Pump Removal & Installation in Section 04 Fuel Delivery).
5. Drain the fuel from the tank.

6. Disconnect the two fuel tank hoses (1).

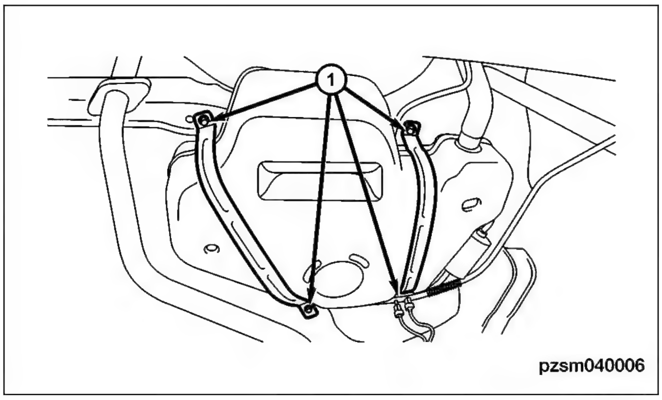

1
pzsm040009

7. Disconnect the vapor canister line (1).
8. Disconnect the fuel line (2).


1
2
pzsm040005

9. Raise and support the vehicle.
10. Using a service jack, support the fuel tank.

11. Remove the four retaining bolts (1) from the fuel tank straps.



12. Remove the fuel tank from the vehicle.
13. Installation is in the reverse order of removal.

STARTING & CHARGING

05

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Charging System **05-11**

STARTING SYSTEM

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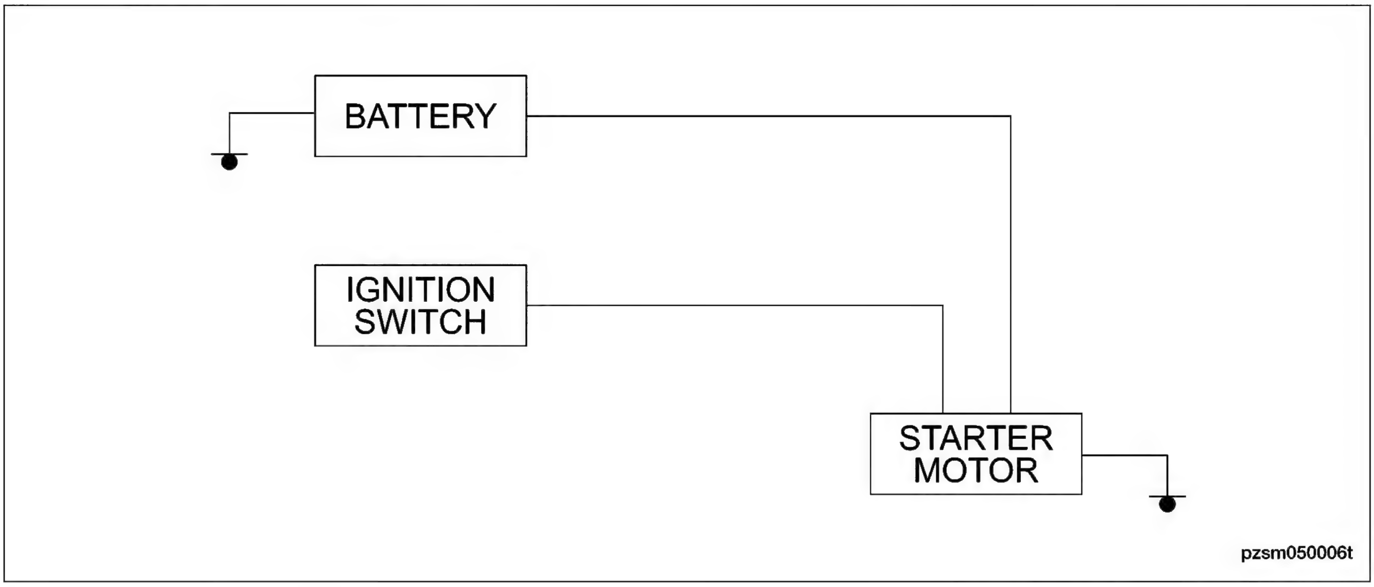
GENERAL INFORMATION

Description



The starting system consists of:
- Starter motor (including an integral starter solenoid)
- Battery
- Battery cables
- Ignition switch and key lock cylinder
- Wire harnesses and connections

Operation

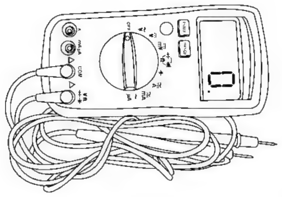
The battery, starting and charging systems operate in conjunction with one another, and must be tested as a complete system. For correct operation of starting/charging systems, all components used in these 3 systems must perform within specifications. When attempting to diagnose any of these systems, it is important that you keep their interdependency in mind. These components form two separate circuits. A high amperage circuit that feeds the starter motor up to 150 amps, and a control circuit that operates on less than 20 amps.

Specifications

Torque Specifications

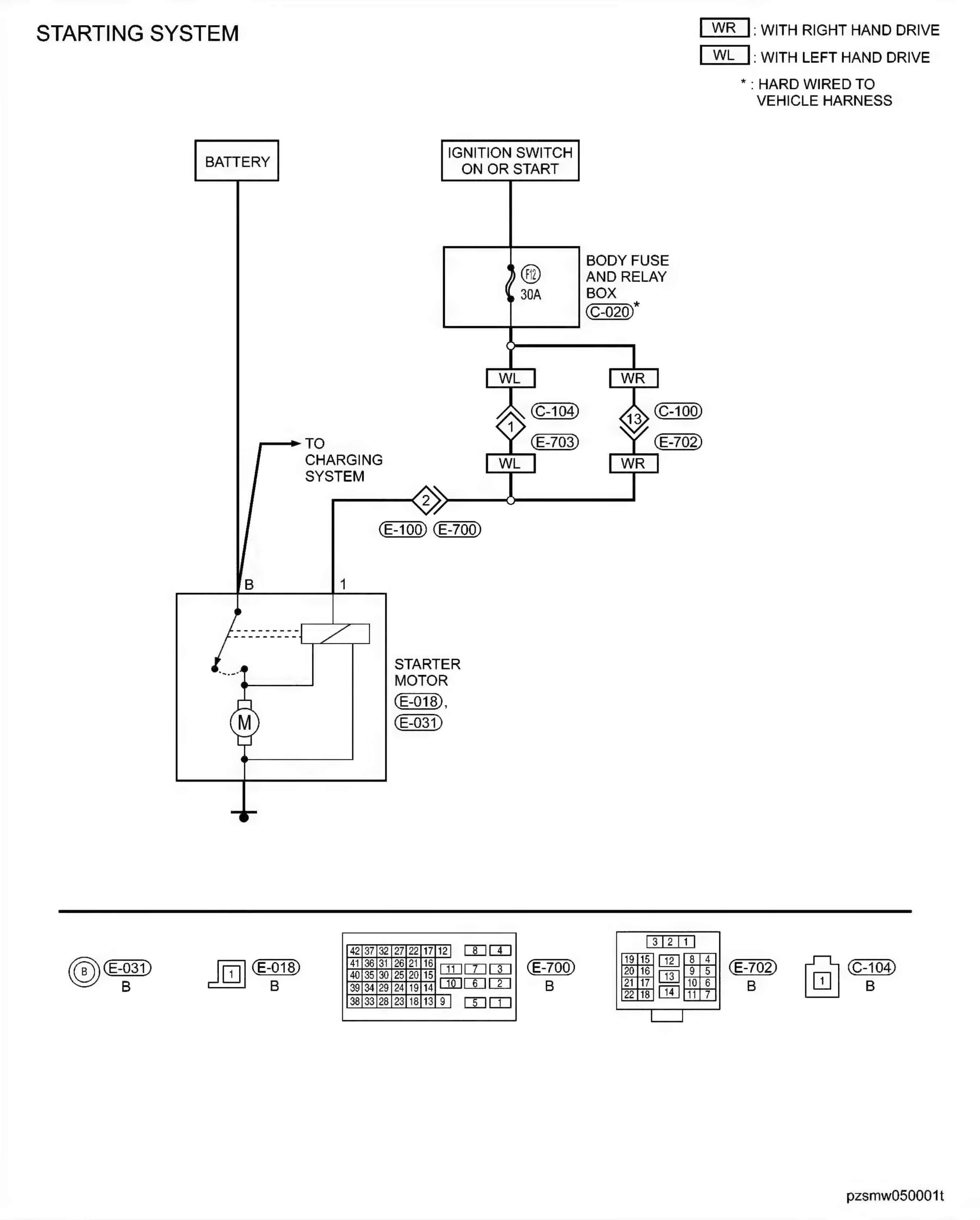
DESCRIPTION	TORQUE (N·m)
Starter Mounting Bolts	30
Battery Positive Cable Nut	10

Special Tools

Digital Multimeter Fluke 15B & 17B	 besm030002

Electrical Schematics

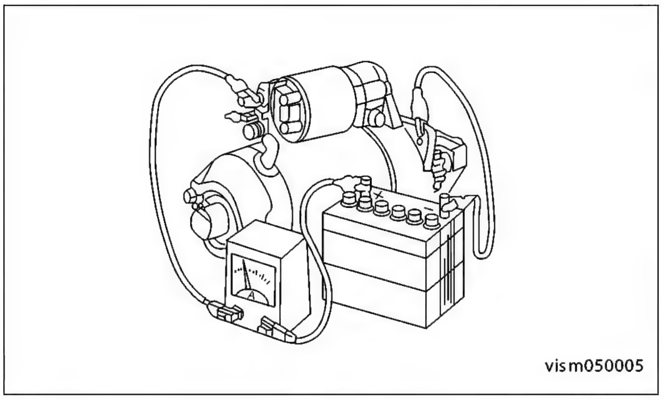
Starting System (Page 1 of 1)


STARTING SYSTEM
WR : WITH RIGHT HAND DRIVE
WL : WITH LEFT HAND DRIVE
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
F12
30A
BODY FUSE AND RELAY BOX
C-020*
WL
WR
C-104
1
E-703
C-100
13
E-702
TO CHARGING SYSTEM
2
E-100
E-700
B
1
M
STARTER MOTOR
E-018,
E-031
E-031
B
E-018
B
E-700
B
E-702
B
C-104
B
pzsmw050001t

DIAGNOSIS AND TESTING

Starter Motor Bench Test

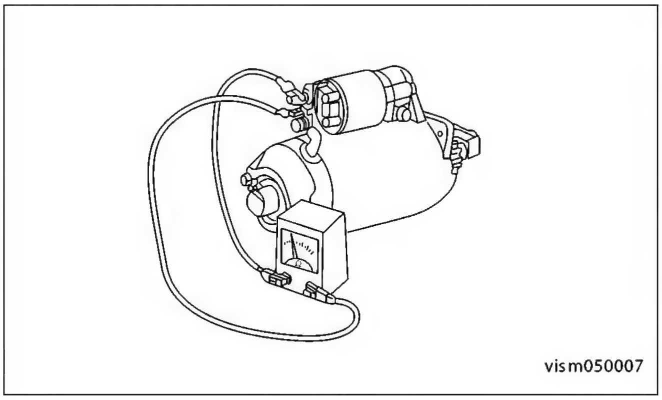
Correct starter motor operation can be confirmed by performing the following free-running bench test. This test can only be performed with the starter motor removed from the vehicle.



1. Remove the starter motor from the vehicle (See Starter Motor Removal & Installation in Section 05 Starting and Charging).
2. Mount the starter motor securely in a soft-jawed bench vise. The vise jaws should be clamped on the mounting flange of the starter motor (never clamp on the starter motor by the field frame).
3. Connect a suitable volt-ampere tester and a 12 V battery to the starter motor in series, and set the ammeter to the 100 ampere scale.
4. Install a jumper wire from the solenoid terminal to the solenoid battery terminal. The starter motor should operate. If the starter motor fails to operate, replace the faulty starter motor assembly.
5. Adjust the carbon pile load of the tester to obtain the free running test voltage.
6. Note the reading on the ammeter and compare this reading to the free-running test maximum amperage draw.
7. If the ammeter reading exceeds the maximum amperage draw specification, replace the faulty starter motor assembly.

Starter Solenoid Test

This test can only be performed with the starter motor removed from the vehicle.



1. Remove the starter motor from the vehicle (See Starter Motor Removal & Installation in Section 05 Starting and Charging).
2. Disconnect the wire from the solenoid field coil terminal.
3. Check the solenoid for continuity between the solenoid terminal and the solenoid field coil terminal with a continuity tester. There should be continuity. If there is continuity, go to Step 4. If not, replace the faulty starter motor assembly.
4. Using a continuity tester, check for continuity between the solenoid terminal and the solenoid case. There should be continuity. If not, replace the faulty starter motor assembly.

ON-VEHICLE SERVICE

Battery

Description

This vehicle is equipped with a single 12-volt battery. All of the components of the battery system are located within the engine compartment of the vehicle. The battery system for this vehicle contains the following components:

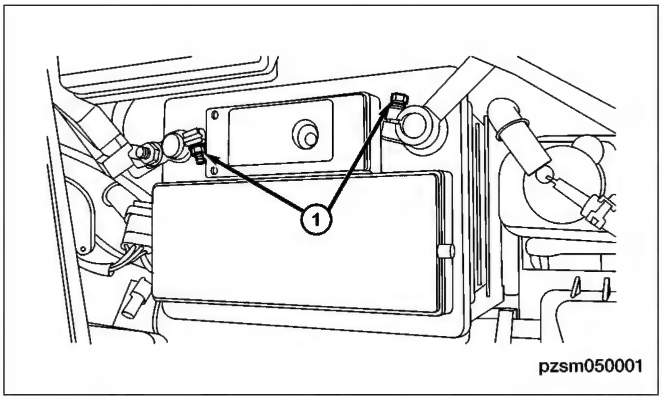
- Battery - The storage battery provides a reliable means of storing a renewable source of electrical energy within the vehicle.
- Battery Cables - The battery cables connect the positive and negative charged battery terminal posts to the vehicle electrical system.
- Battery Hold Down - The battery hold down hardware secures the battery in the battery tray.
- Battery Tray - The battery tray provides a secure mounting location in the vehicle for the battery and an anchor point for the battery hold down hardware.

Operation

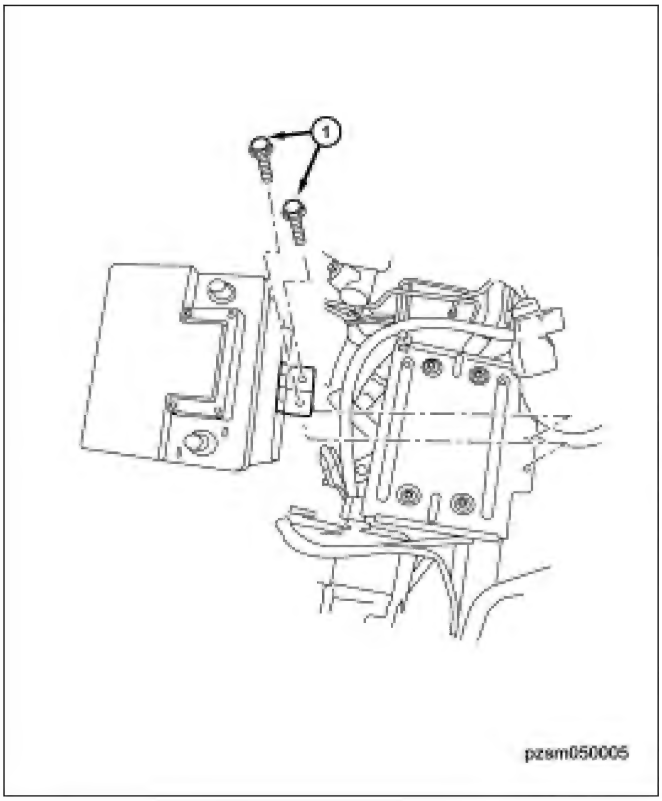
The battery is designed to store electrical energy in a chemical form. When an electrical load is applied to the terminals of the battery, an electrochemical reaction occurs. This reaction causes the battery to discharge electrical current from its terminals. As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water. The chemical changes within the battery are caused by the movement of excess or free electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

Removal & Installation

1. Loosen the negative and positive battery cable retaining nuts (1) and disconnect the cables.



2. Remove the two battery retaining bolts (1).

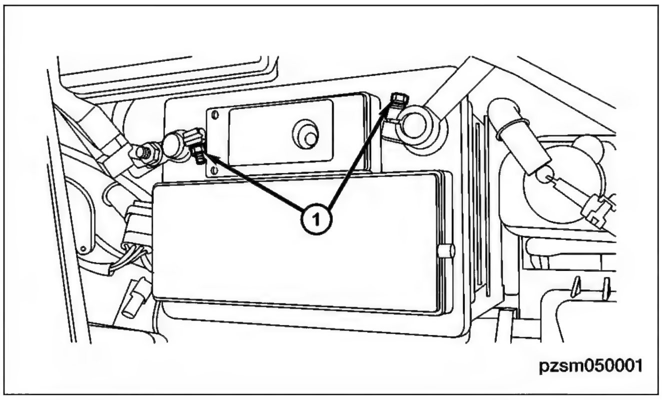


3. Remove the battery.
4. Installation is in the reverse order of removal.

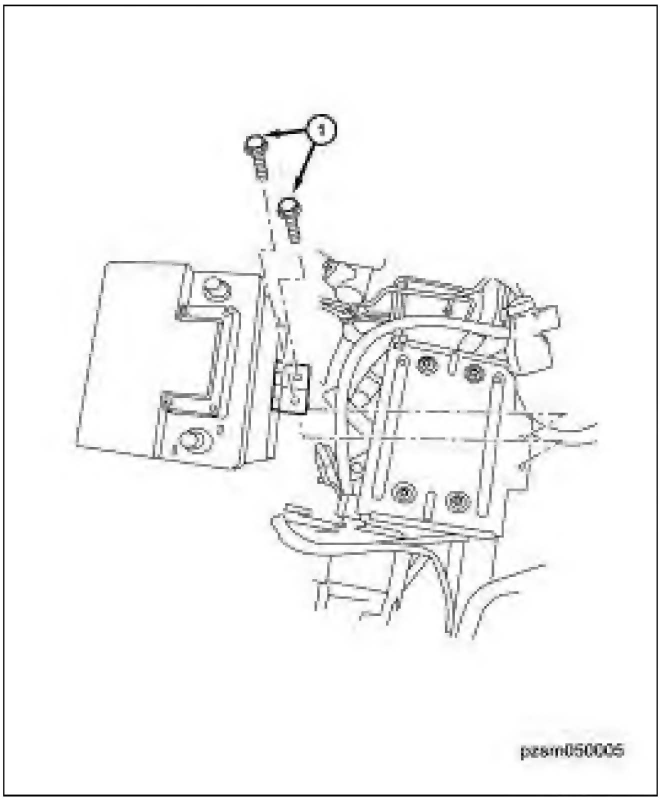
Battery Tray

Removal & Installation

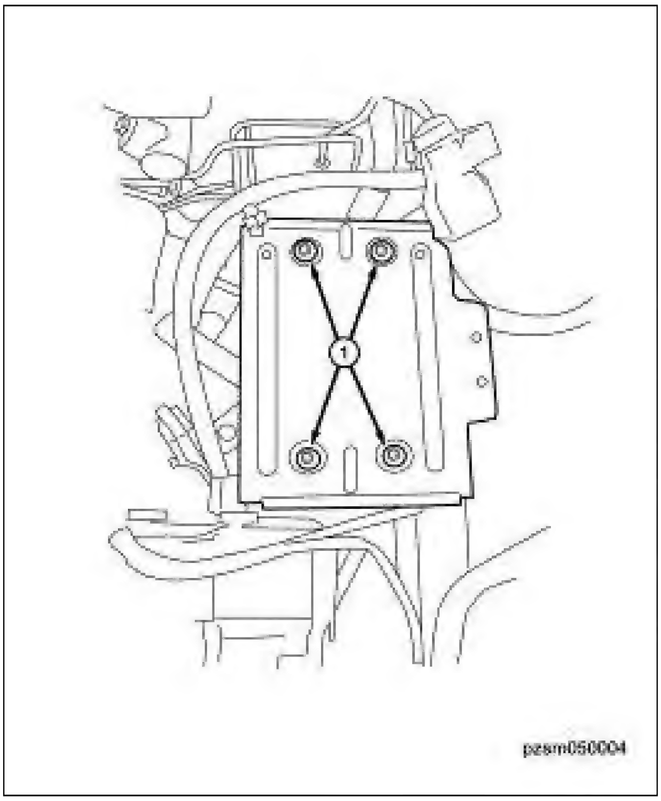
1. Loosen the negative and positive battery cable retaining nuts (1) and disconnect the cables.



2. Remove the two battery retaining bolts (1).



3. Remove the four bolts (1) from the battery tray.



4. Lift the battery tray out of the engine compartment and remove from the vehicle.
5. Installation is in the reverse order of removal.

Positive Battery Cable

Removal & Installation

1. Disconnect the negative battery terminal.
2. Disconnect the positive battery terminal.
3. Remove the battery cable from the B+ terminal of the generator.
4. Remove the battery cable from the B+ terminal of the starter motor.
5. One at a time, trace the battery cable retaining push pins, fasteners and routing clips until the cables are free from the vehicle.
6. Remove the battery cable from the engine compartment.
7. Installation is in the reverse order of removal.

Negative Battery Cable

Removal & Installation

1. Disconnect the negative battery terminal.
2. Remove the bolts securing the negative cable to the body ground.
3. One at a time, trace the battery cable retaining push pins, fasteners and routing clips until the cables are free from the vehicle.
4. Remove the battery cable from the engine compartment.
5. Installation is in the reverse order of removal.

Starter Motor Assembly

Description

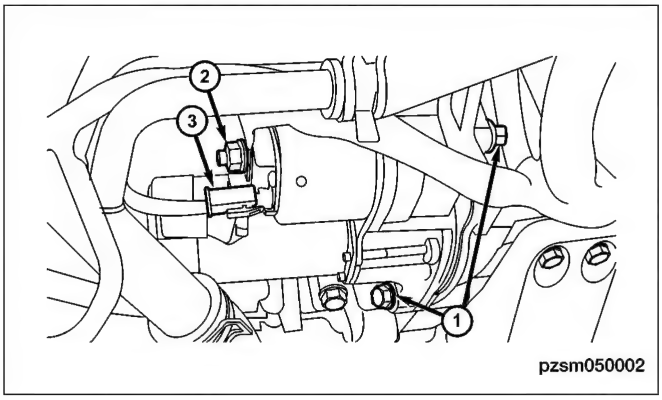
The starter motor is mounted with two bolts to the transaxle housing and is located on the side of the engine. The starter motor incorporates several features to create a reliable, efficient, compact, lightweight and powerful unit. The electric motor of the starter features electromagnetic field coils wound around pole shoes, and brushes contact the motor commutator. The starter motor is serviced only as a unit and cannot be repaired.

Operation

The starter motor is equipped with a planetary gear reduction system. The planetary gear reduction system consists of a gear that is integral to the output end of the electric motor armature shaft that is in continual engagement with a larger gear that is splined to the input end of the starter pinion gear shaft. This feature makes it possible to reduce the dimensions of the starter. At the same time, it allows higher armature rotational speed and delivers increased torque through the starter pinion gear to the starter ring gear.

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the electrical connector from the starter.
3. Remove the air cleaner housing (See Air Cleaner Housing Removal & Installation in Section 02 Engine).
4. Remove the starter battery B+ terminal nut (2).
   (Tighten: Starter B+ terminal nut to 10 N·m)
5. Remove the starter solenoid connector (3).
6. Remove the two starter mounting bolts (1) connecting the starter and transaxle.
   (Tighten: Starter mounting bolts to 30 N·m)



7. Remove the starter from the engine.
8. Installation is in the reverse order of removal.

CHARGING SYSTEM

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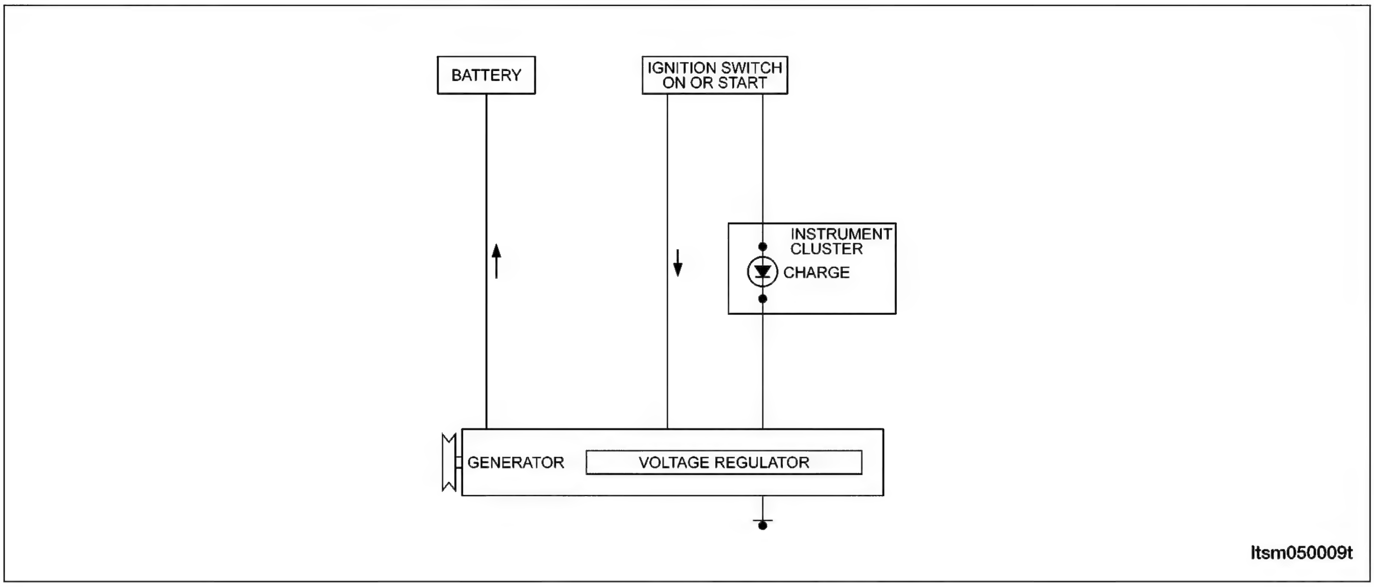
- Generator Noise 05-14

ON-VEHICLE SERVICE 05-15

Generator 05-15
- Removal & Installation 05-15
- Generator Inspection 05-15

GENERAL INFORMATION

Description


BATTERY
IGNITION SWITCH ON OR START
INSTRUMENT CLUSTER
CHARGE
GENERATOR
VOLTAGE REGULATOR
ltsm050009t

The generator is belt-driven by the engine. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced. The generator produces DC voltage.

Operation

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil.

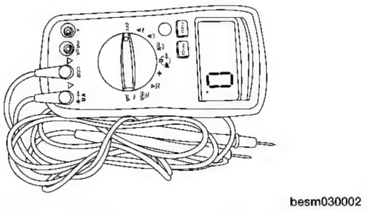
The Y-type stator winding connections deliver the induced AC current to 3 positive and 3 negative diodes for rectification. From the diodes, rectified DC current is delivered to the vehicle's electrical system through the generator, battery, and ground terminals.

Specifications

Torque Specifications

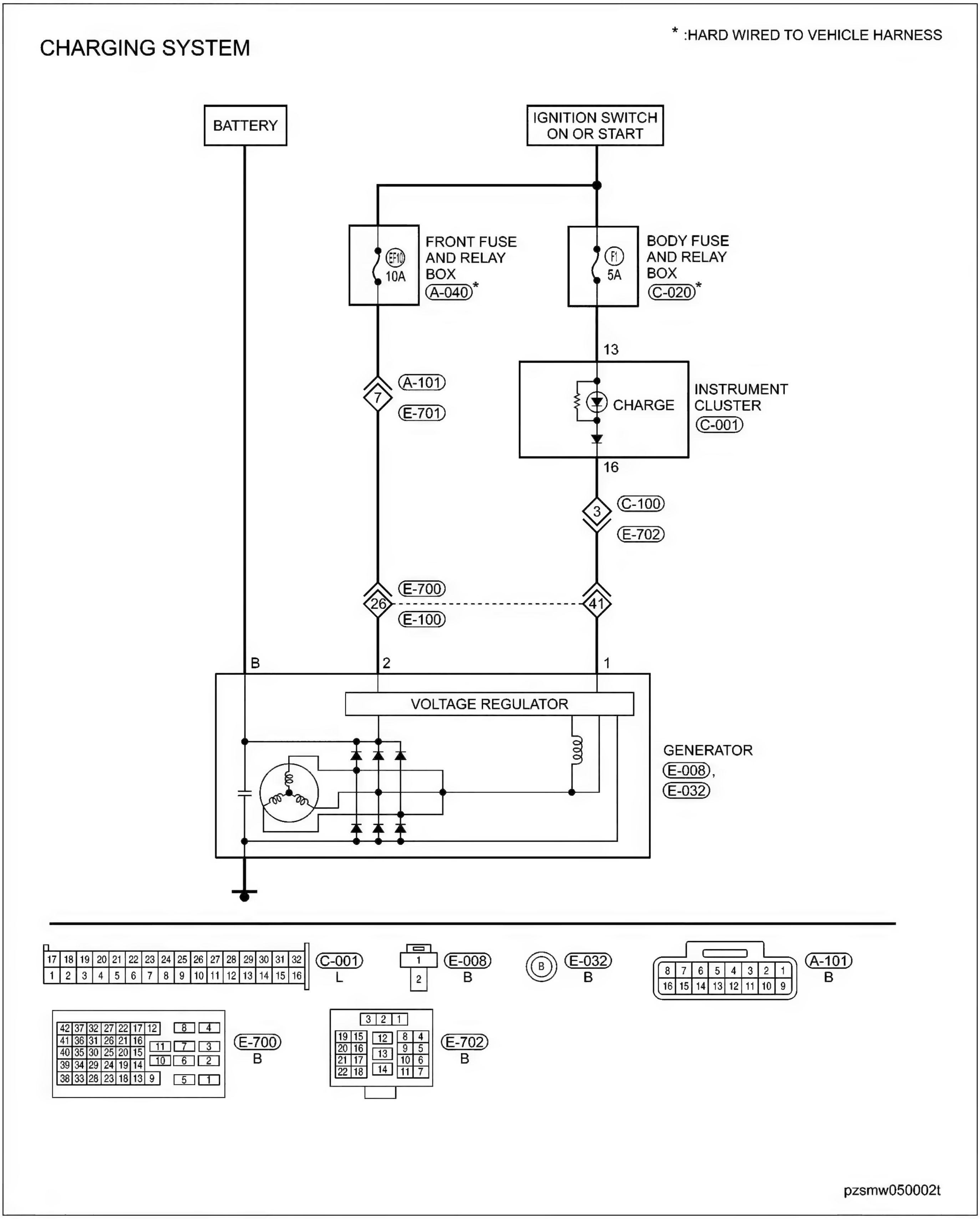
DESCRIPTION	TORQUE (N·m)
Generator Cable Nut	13
Generator Mounting Bolt	30

Special Tools

Digital Multimeter Fluke 15B & 17B	 besm030002

Electrical Schematics

Charging System (Page 1 of 1)


CHARGING SYSTEM
* :HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
EF10
10A
FRONT FUSE AND RELAY BOX
A-040*
F1
5A
BODY FUSE AND RELAY BOX
C-020*
13
CHARGE
INSTRUMENT CLUSTER
C-001
16
7
A-101
E-701
3
C-100
E-702
26
E-700
E-100
41
B
2
1
VOLTAGE REGULATOR
GENERATOR
E-008,
E-032
C-001
L
E-008
B
E-032
B
A-101
B
E-700
B
E-702
B
pzsmw050002t

DIAGNOSIS & TESTING

Generator Noise

Noise emitting from the generator may be caused by the following:

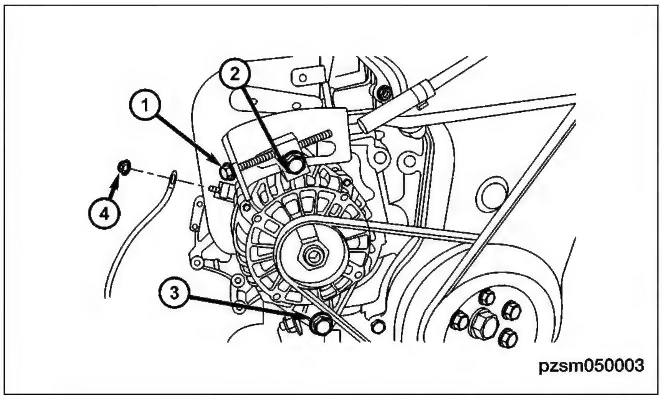
- Worn, loose or defective bearings
- Loose or defective drive pulley
- Incorrect, worn, damaged or misadjusted drive belt
- Loose mounting bolts
- Misaligned drive pulley
- Defective stator
- Damaged internal fins

ON-VEHICLE SERVICE

Generator

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the generator electrical connector.
3. Disconnect the generator cable nut (4).
4. Loosen the generator belt tension bolt (1) to remove the generator drive belt.
5. Remove the generator upper retaining bolt (2).
6. Remove the generator lower retaining bolt (3). (Tighten: Generator mounting bolts to 30 N·m)



7. Remove the generator from the engine.
8. Installation is in the reverse order of removal.

Installation Note:

- After the generator is installed, adjust the drive belt tension.

Generator Inspection

1. Start the engine.
   NOTE: If the battery warning lamp lights, there may be a problem with the charging system.
2. With the engine running, check the output voltage of the generator with a digital multimeter (note the voltage).
3. If the voltage is between 14.1 - 14.7 V, the generator is good.

COOLING
06

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COOLING SYSTEM

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GENERAL INFORMATION

Description

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as soon as possible, maintains normal operating temperature and prevents overheating.

The cooling system also provides a means of heating the passenger compartment. The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

The cooling system consists of the following components:
- Radiator
- Coolant
- Coolant pump
- Electric cooling fans
- Thermostat
- Coolant reservoir
- Hoses and clamps
- Coolant temperature sensor
- Heater core

Operation

The primary purpose of a cooling system is to maintain engine temperature in a range that will provide satisfactory engine performance and emission levels under all expected driving conditions. It also provides hot coolant for heater performance. This is done by transferring heat from engine metal to coolant, moving the heated coolant to the radiator, and then transferring the heat to the ambient air.

Specifications

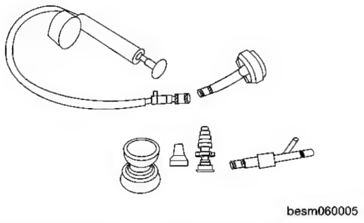
Torque Specifications

DESCRIPTION	TORQUE (N·m)
Coolant Pump Mounting Bolts	8 ± 3
Radiator Support Mounting Bolts	5
Coolant Fan Mounting Bolts	5
Thermostat Mounting Bolts	8 ± 3

Fluid Specifications

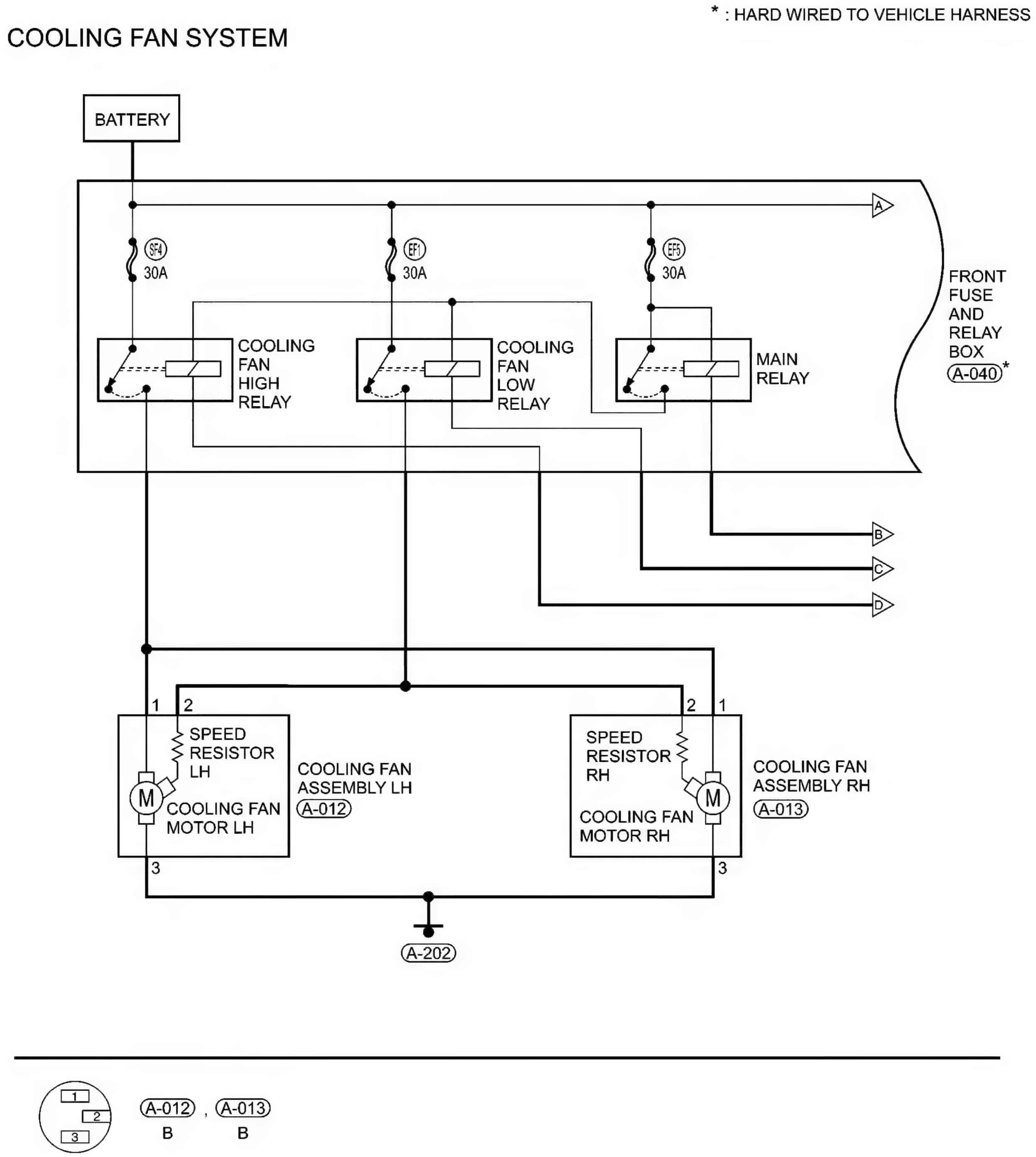
DESCRIPTION	CAPACITY (L)
Cooling System	6.5

Special Tools

Cooling System Pressure Tester	

Electrical Schematics

Cooling System (Page 1 of 3)


* : HARD WIRED TO VEHICLE HARNESS
COOLING FAN SYSTEM
BATTERY
SF4
30A
EF1
30A
EF5
30A
A
COOLING FAN HIGH RELAY
COOLING FAN LOW RELAY
MAIN RELAY
FRONT FUSE AND RELAY BOX
A-040*
B
C
D
1
2
SPEED RESISTOR LH
M
COOLING FAN MOTOR LH
COOLING FAN ASSEMBLY LH
A-012
3
2
1
SPEED RESISTOR RH
M
COOLING FAN MOTOR RH
COOLING FAN ASSEMBLY RH
A-013
3
A-202
1
2
3
A-012 , A-013
B B

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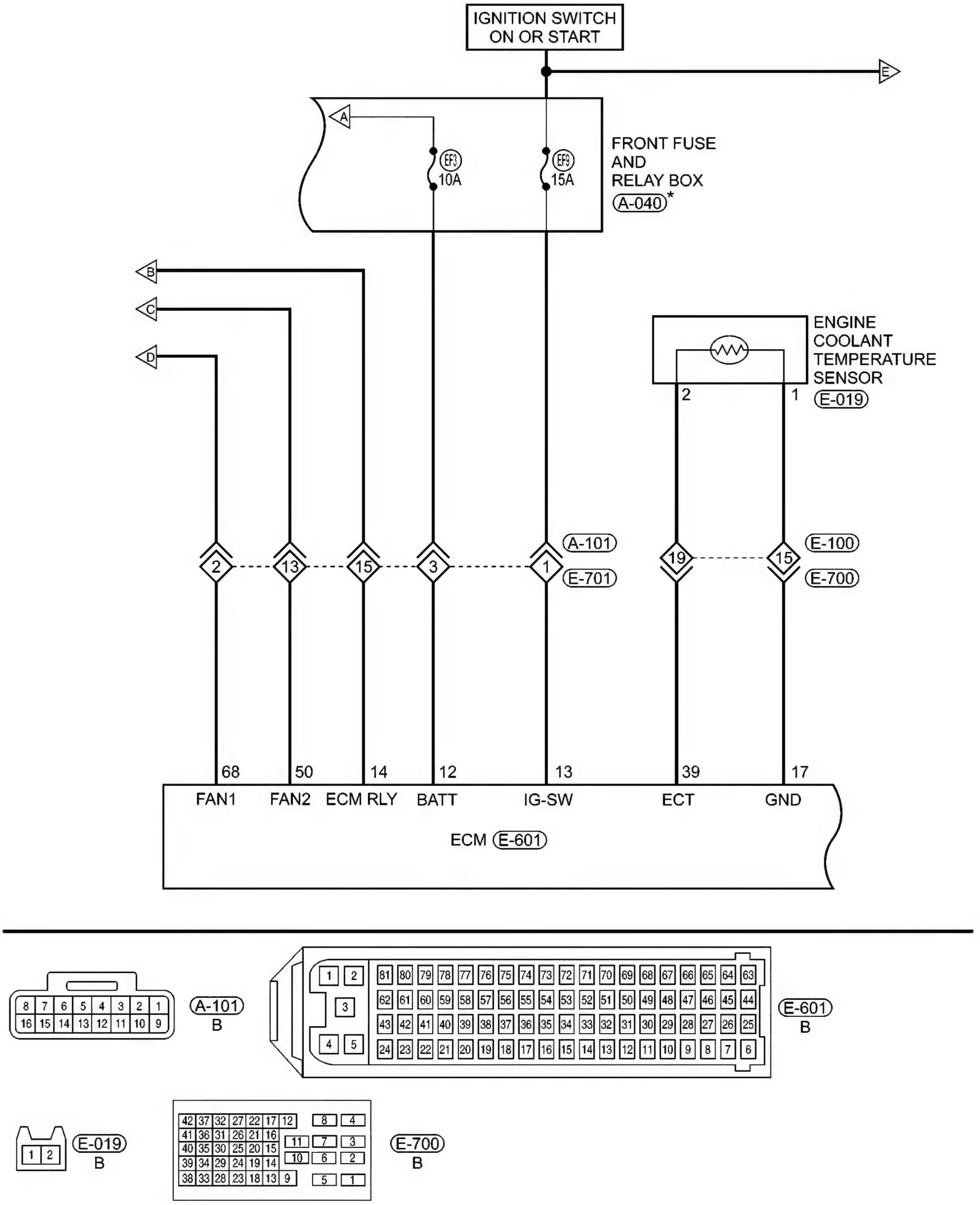
Cooling System (Page 2 of 3)

* : HARD WIRED TO VEHICLE HARNESS


IGNITION SWITCH ON OR START
E
A
EF3 10A
EF9 15A
FRONT FUSE AND RELAY BOX
A-040*
B
C
D
ENGINE COOLANT TEMPERATURE SENSOR
E-019
2
1
2
13
15
3
1
A-101
E-701
19
15
E-100
E-700
68
50
14
12
13
39
17
FAN1
FAN2
ECM RLY
BATT
IG-SW
ECT
GND
ECM E-601
A-101 B
E-601 B
E-019 B
E-700 B

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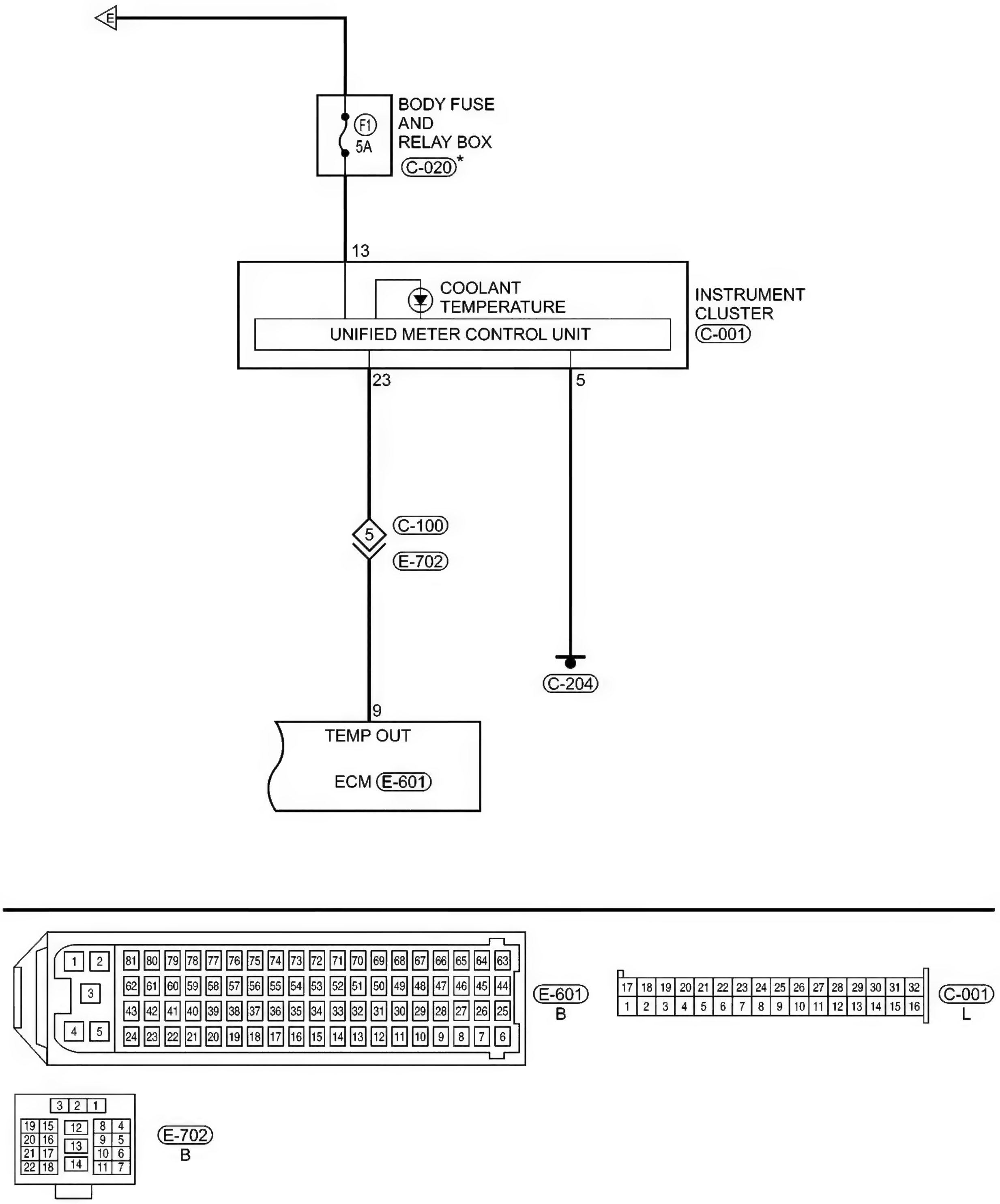
* : HARD WIRED TO VEHICLE HARNESS


E
BODY FUSE AND RELAY BOX
F1
5A
C-020*
13
COOLANT TEMPERATURE
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
23
5
5
C-100
E-702
C-204
9
TEMP OUT
ECM E-601
1 2 3 4 5
81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63
62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44
43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
E-601
B
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-001
L
3 2 1
19 15 20 16 21 17 22 18
12 13 14
8 4 9 5 10 6 11 7
E-702
B

pzsmw060003t

DIAGNOSIS AND TESTING

Cooling System Pressure Test

WARNING!

Always allow the engine to cool before opening the cooling system. Do not loosen the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

CAUTION:
Do not pressurize the cooling system beyond the maximum pressure listed in the specifications table in this section, or cooling system components can be damaged.

1. Turn the engine off.
2. Check the engine coolant level. Adjust the coolant level as necessary.
3. Attach the pressure tester to the coolant recovery reservoir. Install a pressure test pump to the quick-connect fitting of the test adapter.
4. Pressurize the engine cooling system. Observe the gauge reading for approximately 2 minutes. Pressure should not drop during this time. If the pressure drops within this time, inspect for leaks and repair as necessary.
5. If no leaks are found and the pressure drops, the pressure relief cap may be leaking. Install a new pressure relief cap and retest the system.
6. If no leaks are found after a new pressure relief cap is installed, and the pressure drops, the leak may be internal to the radiator transmission cooler (if equipped). Inspect the coolant for transmission fluid and the transmission fluid for coolant. Repair as necessary.
7. If there is no contamination of the coolant or transmission fluid, the leak may be internal to the engine. Inspect the coolant for engine oil and the engine oil for coolant.
8. Release the system pressure by loosening the pressure relief cap. Check the coolant level and adjust as necessary.

Cooling System Concentration Test

CAUTION:
Do not mix types of coolant, corrosion protection will be severely reduced.

Coolant concentration should be checked when any additional coolant is added to the cooling system or after a coolant drain, flush and refill. The coolant mixture offers optimum engine cooling and protection against corrosion when mixed to a freeze point of -37°C to -46°C. The use of a hydrometer or a refractometer can be used to test coolant concentration.

Cooling System Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Loss of Coolant	· Coolant hoses or tubes · Hose clamps · Coolant pump gasket · Thermostat gasket · Thermostat housing · Radiator · Coolant reservoir · Pressure relief cap · Coolant pump leaking · Heater core · Engine gaskets (may leak internally or externally) · Cylinder block core plugs	· Replace coolant hoses or tubes · Replace hose clamps · Replace coolant pump gasket · Replace thermostat gasket · Repair/replace thermostat housing · Repair/replace radiator · Replace coolant reservoir · Replace pressure relief cap · Replace coolant pump · Replace heater core · Replace engine gaskets · Replace cylinder block core plugs
Engine Overheats	· Low coolant level · External engine coolant leak · Air lock in system · Pressure relief cap installation · Restricted airflow through the A/C condenser/radiator · Internal engine coolant leak · Coolant condition/concentration · Electric cooling fan · Radiator · Thermostat · Engine coolant temperature indicator gauge · Heater core · Coolant pump · Coolant flow restriction	· Add coolant as needed · Repair engine coolant leak · Bleed air from cooling system · Ensure pressure relief cap is installed correctly · Remove restriction from the A/C condenser/radiator · Repair internal engine coolant leak · Repair coolant condition/ concentration as needed · Replace electric cooling fan(s) · Repair/replace radiator · Replace thermostat · Verify engine coolant temperature indicator gauge operation · Replace heater core · Replace coolant pump · Repair cause of coolant flow restriction
Engine Does Not Reach Normal Operating Temperature	· Thermostat · Electric cooling fan always on · Engine coolant temperature indicator gauge	· Replace thermostat · Repair cause of electric cooling fan always on · Verify engine coolant temperature indicator gauge operation
Electric Cooling Fan(s) Does Not Operate	· Fuse and Relay Box · Wiring · Relay(s) · Fuse(s) · Engine Control Module (ECM) · Cooling fan motor(s)	· Repair/replace Fuse and Relay Box · Repair wiring · Replace relay(s) · Replace fuse(s) · Replace the ECM · Replace cooling fan motor(s)
Electric Cooling Fan(s) On All The Time	· Wiring · Relay(s) · Engine Control Module (ECM)	· Repair wiring · Replace relay(s) · Replace the ECM

ON-VEHICLE SERVICE

Cooling System Draining and Filling

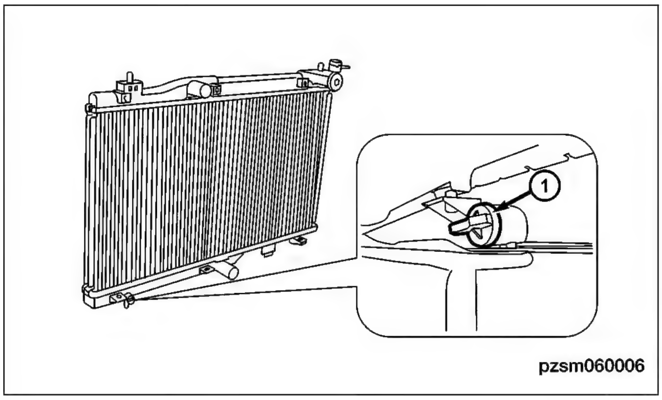
Cooling System Draining Procedure

WARNING!

Never remove the pressure relief cap, under any conditions, while the engine is operating or hot. Failure to follow these instructions could result in personal injury or damage to the cooling system or engine. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When you are certain all the pressure has been released, using a cloth turn and remove the pressure relief cap. Failure to follow these instructions may result in serious personal injury.

Perform the following procedure when draining the cooling system.

1. DO NOT remove the pressure cap first with the engine hot.
2. With the engine cold, remove the pressure cap.
3. Raise and support the vehicle on a hoist.
4. Attach one end of a hose to the drain plug (1). Put the other end into a clean container. Remove the drain plug (1) and drain the coolant from the radiator.



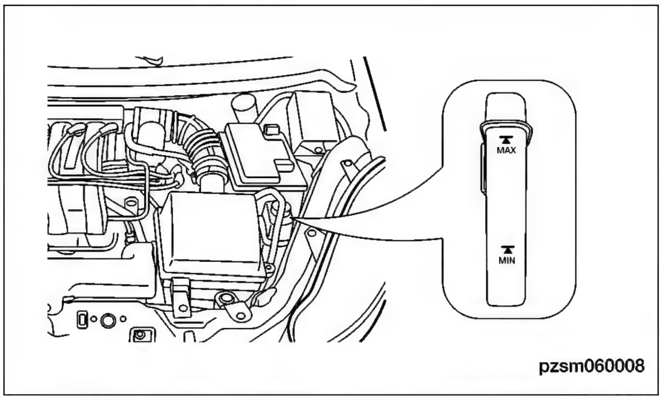
5. After the radiator is empty, install the radiator drain plug.

Cooling System Filling Procedure

CAUTION:
Failure to purge air from the cooling system can result in an overheating condition and severe engine damage.

Perform the following procedure when filling the cooling system.

1. Fill the system using the proper mixture of anti-freeze/coolant and water. Fill the coolant recovery reservoir to the ″MAX″ line and install the pressure cap.



2. With the heater control in the HEAT position, start and operate the engine with coolant recovery reservoir cap in place.
3. Add coolant to the coolant recovery reservoir as necessary. Only add coolant to the coolant recovery reservoir when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.

Thermostat

Description

The thermostat is located in the thermostat housing. The thermostat housing is located on the top of the engine between the engine and the radiator.

Operation

The thermostat controls the operating temperature of the engine by controlling the amount of engine coolant flow to the radiator. The thermostat opens when the engine coolant temperature is approximately 90°C. At this temperature, engine coolant is allowed to flow to the radiator. The thermostat provides quick engine warm up and overall temperature control. The thermostat begins to close below 90°C. The thermostat controls this by the use of a wax pellet located in a sealed container at the spring end of the thermostat. When heated, the pellet expands and overcomes the closing spring tension to force the valve to open, and when cooled, the pellet contracts and the closing spring then forces the valve to close.

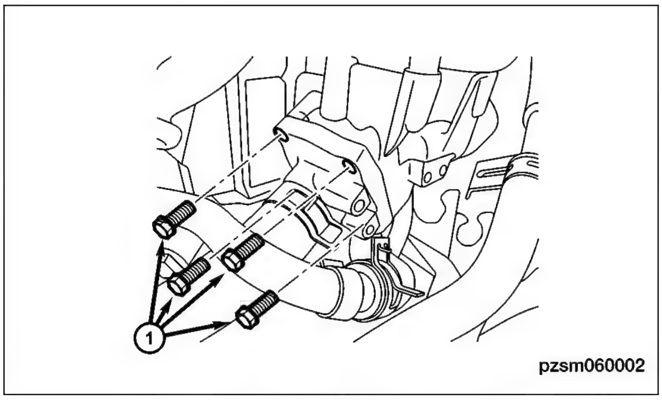
Removal & Installation

WARNING!

Always allow the engine to cool before opening the cooling system. Do not loosen the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

1. Drain the cooling system (See Cooling System Draining Procedure in Section 06 Cooling System).
2. Remove the coolant hose.

3. Remove the four thermostat housing mounting bolts (1).
   (Tighten: Thermostat housing mounting bolts to 8 ± 3 N·m)



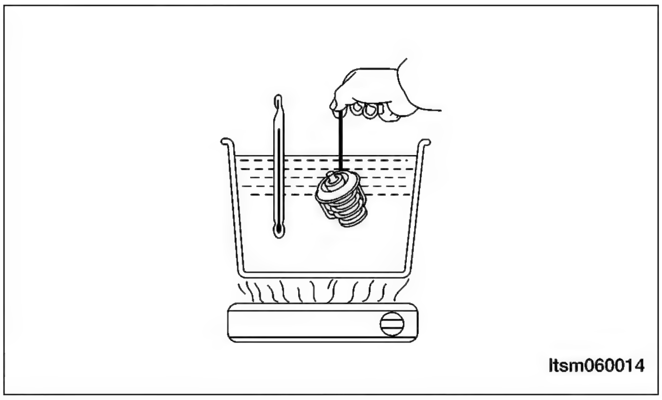
4. Remove the thermostat and gasket.
5. Installation is in the reverse order of removal.

Installation Notes:

- Replace the thermostat gasket.
- Verify the cooling system is filled to proper specifications.
- Start the engine and verify there are no leaks in the cooling system.

Thermostat Inspection

1. Inspect the sealing surface of the thermostat (the seat should be tight at room temperature).
2. Inspect the opening temperature and maximum stroke of the thermostat.
   - Opening temperature of the thermostat is 87 ± 2°C
   - Maximum stroke of the thermostat is 8 mm
   - Full opening temperature of the thermostat is 104°C
3. Verify the thermostat closes 5°C lower than the opening temperature.
4. If the thermostat fails any of the inspection steps, replace the thermostat.



Coolant Pump

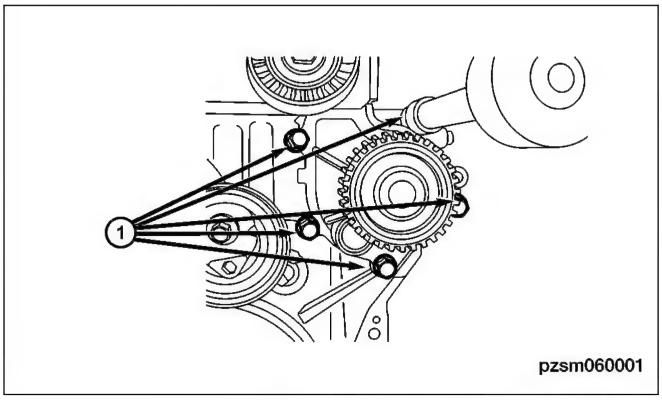
Removal & Installation

WARNING!

Always allow the engine to cool before opening the cooling system. Do not loosen the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

1. Drain the cooling system (See Cooling System Draining Procedure in Section 06 Cooling System).
2. Remove the timing belt (See Timing Belt Removal & Installation in Section 02 Engine).

3. Remove the five coolant pump mounting bolts (1). (Tighten: Coolant pump mounting bolts to 8 ± 3 N·m)



4. Remove the coolant pump and gasket.

   NOTE: When removing the coolant pump, be careful not to damage the gasket surface. The coolant pump can not be repaired, it must be replaced.
5. Installation is in the reverse order of removal.

Installation Notes:

- Replace the coolant pump gasket.
- Verify the cooling system is filled to proper specifications.
- Start the engine and verify there are no leaks in the cooling system.

Coolant Pump Inspection

Check coolant seal of the coolant pump for coolant leak. If coolant pump bearing is loose, replace the assembly.

Radiator

Description

The radiator is a cross-flow type (horizontal tubes) with design features that provide greater strength, as well as sufficient heat transfer capabilities to keep the engine coolant within operating temperatures.

Operation

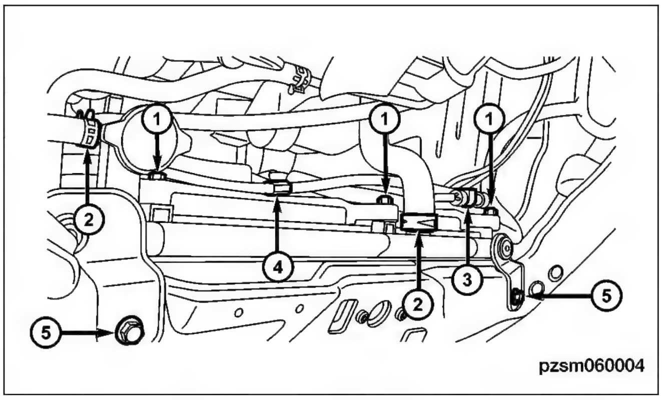
The radiator functions as a heat exchanger, using air flow across the exterior of the radiator tubes. Heat from the coolant is then transferred from the radiator into the moving air.

Removal & Installation

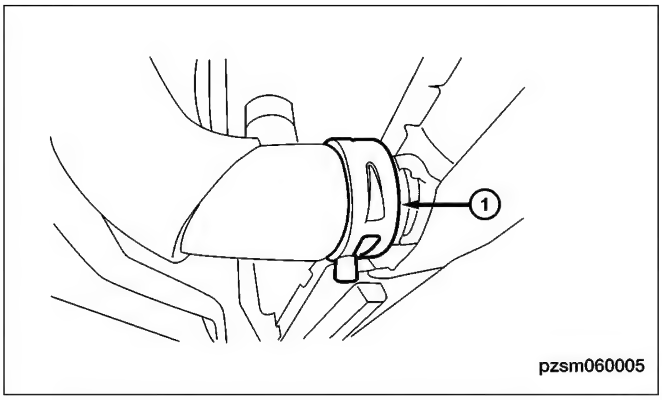
WARNING!
Always allow the engine to cool before opening the cooling system. Do not loosen the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

1. Disconnect the negative battery cable.
2. Drain the cooling system (See Cooling System Draining and Filling in Section 06 Cooling System).
3. Remove the air intake pipe retaining bolt.

4. Disconnect the upper radiator hose (2) from the radiator.
5. Loosen the clip (4) from the coolant return hose.
6. Disconnect the cooling fan electrical connector (3).
7. Remove the cooling fan mounting bolts (1).
8. Remove the two radiator support retaining bolts (5) and remove the two radiator supports.
   (Tighten: Radiator support mounting bolts to 5 N·m)



9. Raise and support the vehicle.
10. Loosen the lower radiator hose clamp (1) and remove the lower radiator hose from the radiator.



11. Remove the radiator from the engine compartment.
12. Installation is in the reverse order of removal.

Installation Notes:

- Verify the cooling system is filled to proper specifications.
- Start the engine and verify there are no leaks in the cooling system.

Cooling Fan

Description

The radiator cooling fans are dual-speed electric motor driven fans. The radiator fan assembly includes two electric motors, two five-blade fans, and a support shroud that is attached to the radiator. The radiator fans are serviced as an assembly.

Operation

The radiator cooling fan operation is controlled by the Engine Control Module (ECM) and the fan relays, with inputs from the following:

- Engine coolant temperature
- A/C signal

Inspect the cooling fan for proper low speed and high speed operation.

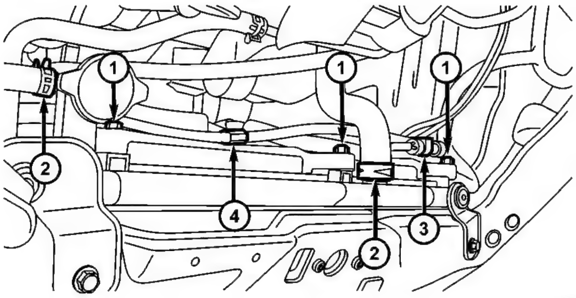
- The low speed fan should be switched on at 98°C and switched off at 94°C.
- The high speed fan should be switched on at 105°C and switched off at 101°C.
- If the water temperature is greater than 101°C after the fan is switched off, the fan will continue to operate for 1 minute.
- If the water temperature is greater than 94°C after the fan is switched off, the fan will continue to operate for 0.5 minute.
- If the water temperature is less than 85°C after the fan is switched off, the fan will stop operating.

Removal & Installation

WARNING!

Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

1. Disconnect the negative battery cable.
2. Drain the cooling system (See Cooling System Draining Procedure in Section 06 Cooling System).
3. Disconnect the upper radiator hose (2) from the radiator.
4. Loosen the clip (4) from the coolant return hose.
5. Disconnect the cooling fan electrical connector (3) and the cooling fan ground cable connected to the body.



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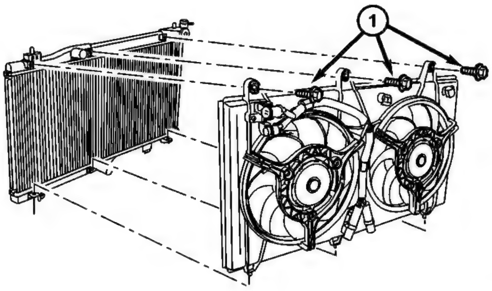
6. Remove the cooling fan mounting bolts (1) from the radiator.
   (Tighten: Cooling fan mounting bolts to 5 N·m)



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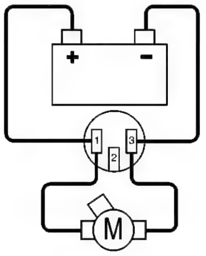
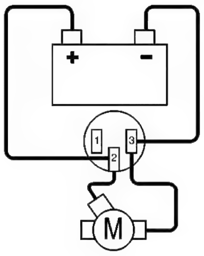
7. Carefully remove the radiator fan from the engine compartment.
8. Installation is in the reverse order of removal.

Installation Notes:

- Verify the cooling system is filled to proper specifications.
- Start the engine and verify there are no leaks in the cooling system.

Cooling Fan Inspection

1. Using the following table, apply battery voltage to the specified connector terminals.
2. Verify that the fan motor operates smoothly when voltage is applied.
3. If the test results are not as specified, replace the fan motor.

MEASURING CONDITION	OPERATION	INSPECTION DIAGRAM
Battery positive (+) to terminal – 1 Battery negative (-) to terminal – 3	Turns smoothly with high speed	 vism060005
Battery positive (+) to terminal – 2 Battery negative (-) to terminal – 3	Turns smoothly with low speed	 vism060006

EXHAUST

07

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Exhaust System **07-1**

EXHAUST SYSTEM

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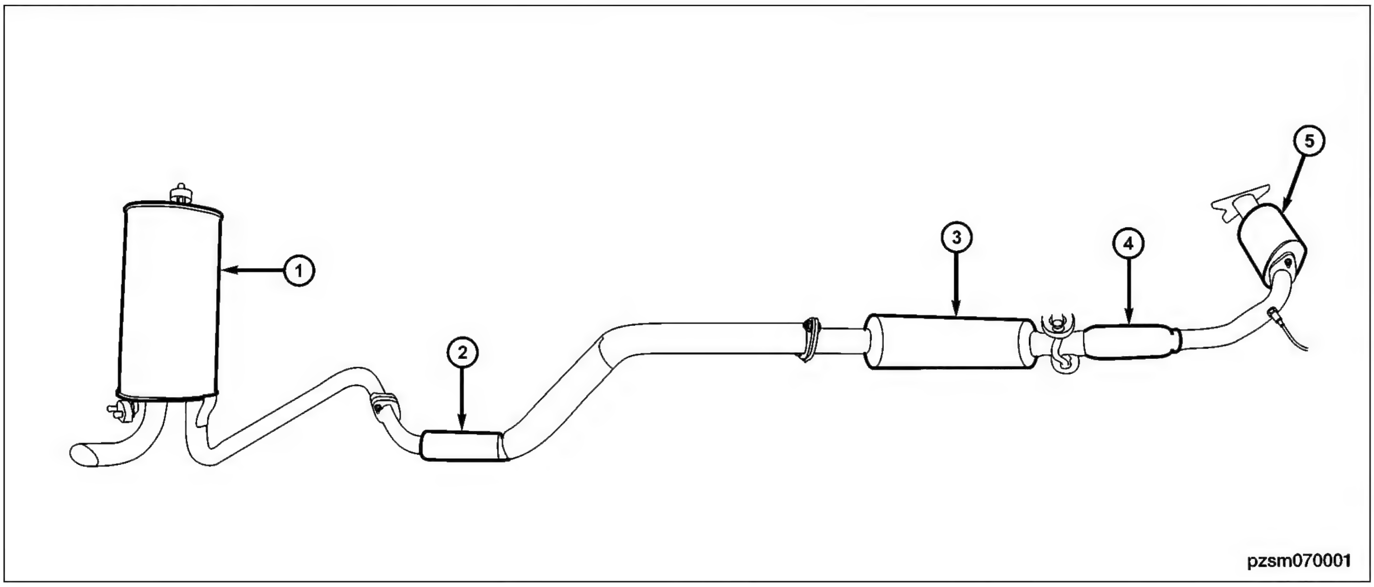
GENERAL INFORMATION

Description

Exhaust System



1 - Rear Muffler Assembly	4 - Main Catalytic Converter Assembly
2 - Middle Muffler Assembly	5 - Pre-Catalytic Converter Assembly
3 - Front Muffler Assembly	

The exhaust system provides an exit for exhaust gases and reduces engine noise by moving exhaust gases through the three-way catalytic converter, a muffler inlet pipe and a muffler. Rubber exhaust hanger insulators attach the exhaust system to the mounting hooks.

The exhaust system contains the following components:
- Catalytic converter assembly
- Muffler assembly
- Exhaust brackets with isolators bolted to the body
- Heated oxygen sensors mounted to the exhaust pipes
- Tailpipe assembly

WARNING!

Exhaust gases contain carbon monoxide which can be harmful to health and are potentially lethal. Exhaust system leaks should be repaired immediately. Never operate the engine in enclosed areas. Failure to follow these instructions may result in personal injury.

Operation

In order to reduce vehicle emissions released by the engine, the catalytic converter is required to perform in all operating conditions. This reduction is especially beneficial during the cold start and warm up phases of operation, which is when a majority of the tailpipe emissions occur on today's cars because the catalytic converter has not yet reached its operating temperature. The exhaust system channels exhaust gases from the engine and away from the vehicle.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Catalytic Converter Mounting Nuts	60 ± 5
Exhaust Flange Bolts	60 ± 5

DIAGNOSIS AND TESTING

Exhaust System Diagnostic Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Excessive Exhaust Noise	· Leaks at pipe joints. · Burned or blown out muffler. · Burned or rusted-out exhaust pipe. · Exhaust pipe leaking at manifold flange. · Exhaust manifold cracked or broken. · Leak between exhaust manifold and cylinder head. · Restriction in muffler or tailpipe. · Exhaust system contacting body or chassis.	· Tighten clamps to specified torque at leaking joints. · Replace muffler assembly. · Replace exhaust pipe. · Tighten connection attaching nuts. · Replace exhaust manifold. · Tighten exhaust manifold to cylinder head stud nuts or bolts. · Remove restriction, if possible. Replace muffler or tailpipe, as necessary. · Re-align exhaust system to clear surrounding components.
Leaking Exhaust Gases	· Leaks at pipe joints.	· Tighten/replace clamps at leaking joints.
Excessive Exhaust Temperature	· Ignition timing incorrect. · Poor fuel quality. · Engine running rich.	· Adjust the timing. · Change and clean the fuel tank. · Repair as needed.

ON-VEHICLE SERVICE

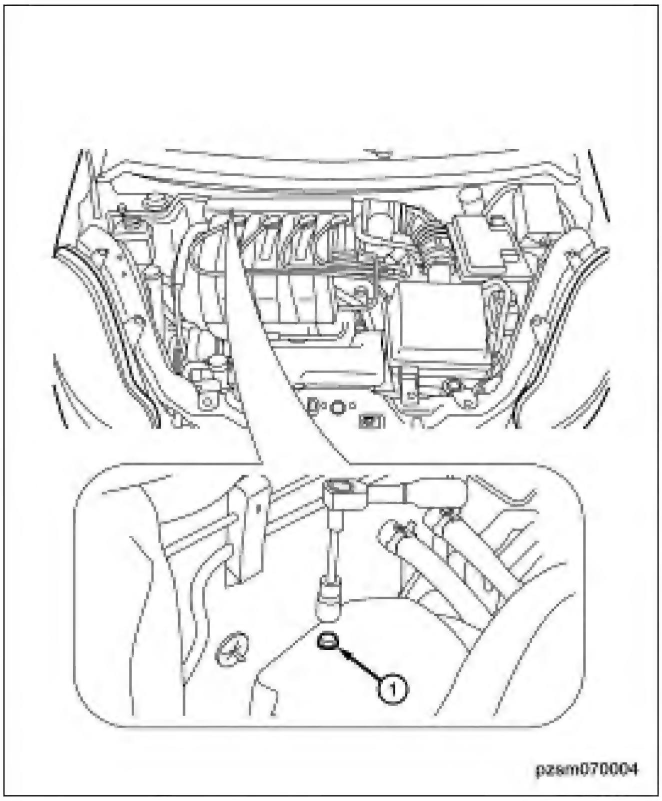
Exhaust Pipe Assembly

Removal & Installation

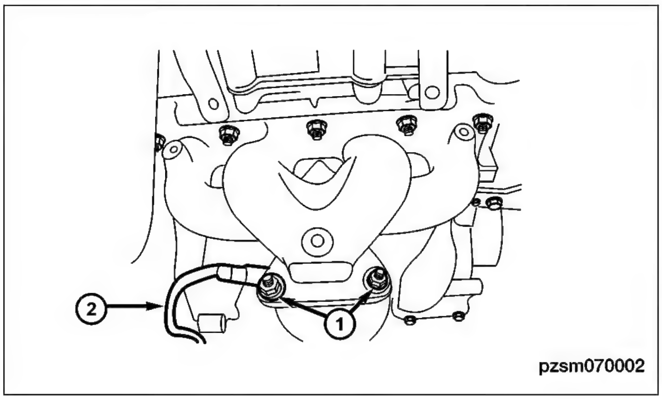
WARNING!

The normal operating temperature of the exhaust system is very high. Therefore, never work around, or attempt to service any part of the exhaust system until it has cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operation.

1. Remove the heat shield retaining bolt (1).



2. Remove the exhaust manifold (See Exhaust Manifold Removal & Installation in Section 02 Engine).
3. Remove the catalytic converter to exhaust manifold connecting bolts (1).
4. Remove the oxygen sensor (2).



5. Raise and support the vehicle.
6. Remove all the support isolators and connecting bolts.

7. Remove the exhaust pipe assembly.
8. Installation is in the reverse order of removal.

Installation Note:

- Replace the gasket between two pipes.

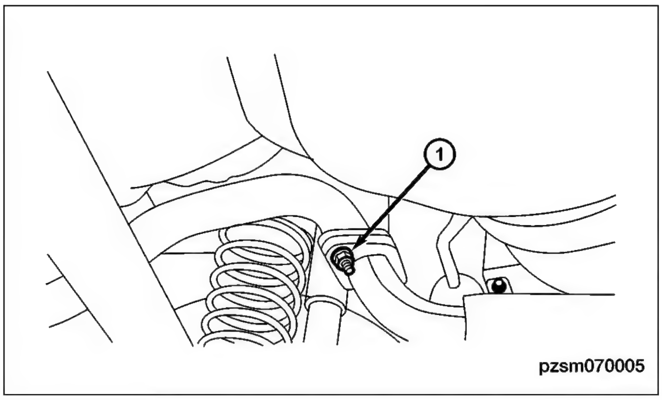
Muffler

Removal & Installation

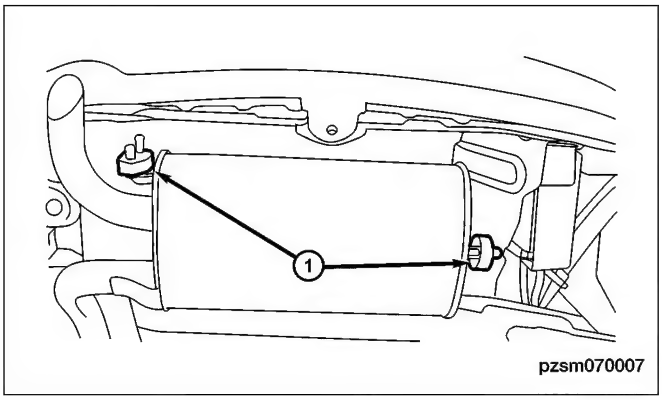
WARNING!

The normal operating temperature of the exhaust system is very high. Therefore, never work around or attempt to service any part of the exhaust system until it has cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operating time.

1. Raise and support the vehicle.
2. Remove the two pipes connecting bolts (1). (Tighten: Exhaust bolts to 60 ± 5 N·m)



3. Remove the muffler support isolators (1).



4. Remove the muffler.
5. Clean exhaust pipe ends and ensure all exhaust components fit properly.
6. Discard broken or worn isolators, rusted or overused clamps, supports, and attaching parts.
7. Installation is in the reverse order of removal.

Installation Note:

- Replace the gasket between two pipes.

Catalytic Converter

Description

The catalytic converter is attached to the exhaust manifold using fasteners and a gasket for sealing.

The catalytic converter plays a major role in the emission control system. The catalytic converter operates as a gas reactor. Its catalytic function is to speed the heat-producing chemical reaction of components in the exhaust gases in order to reduce air pollutants.

Operation

Catalyst operation is dependent on its ability to store and release the oxygen needed to complete the emissions-reducing chemical reactions. As a catalyst deteriorates, its ability to store oxygen is reduced. Since the catalyst's ability to store oxygen is somewhat related to proper operation, oxygen storage can be used as an indicator of catalyst performance.

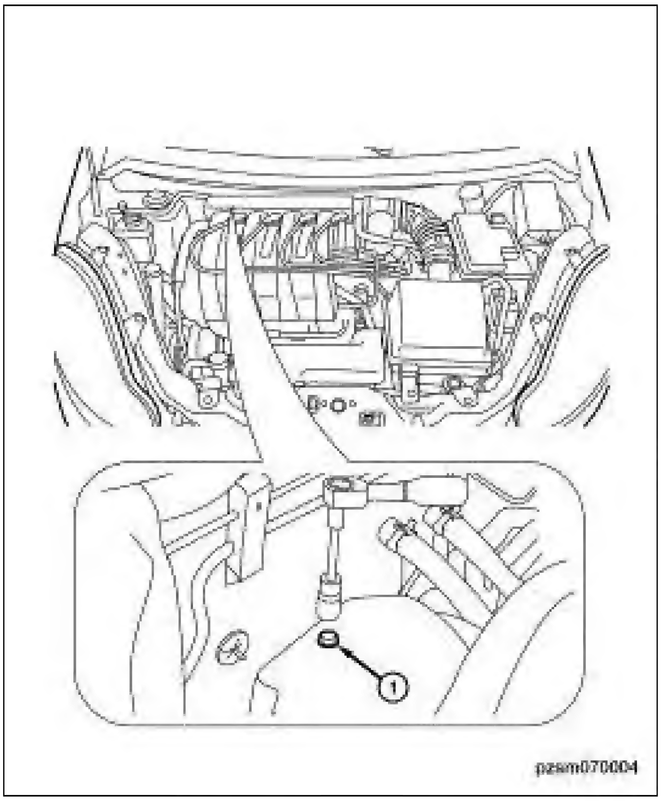
CAUTION:
Unleaded gasoline must be used in order to avoid damaging the catalyst core.

Removal & Installation

WARNING!

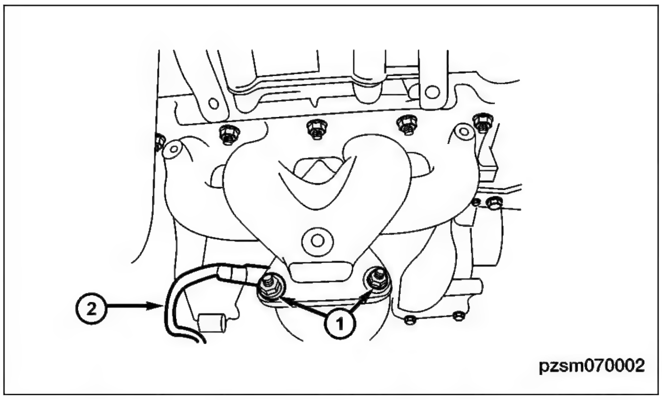
The normal operating temperature of the exhaust system is very high. Therefore, never work around or attempt to service any part of the exhaust system until it has cooled. Special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operating time.

1. Disconnect the negative battery cable.
2. Remove the heat shield retaining bolt (1).

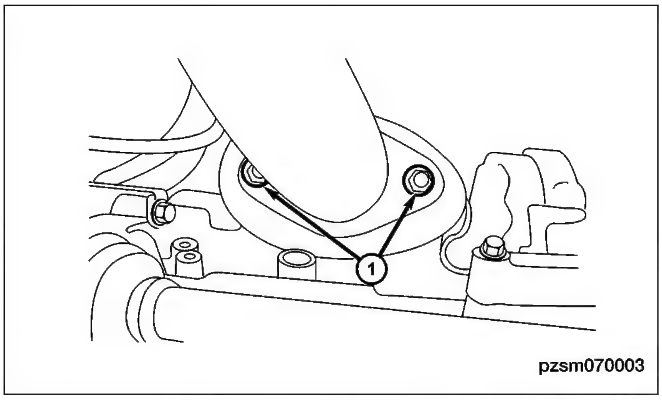


3. Remove the exhaust manifold (See Exhaust Manifold Removal & Installation in Section 02 Engine).

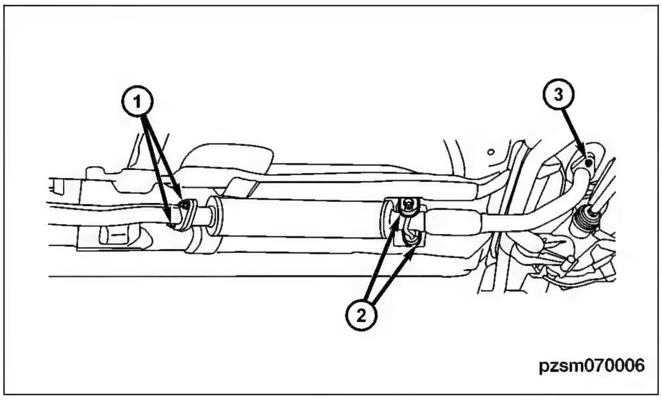
4. Remove the catalytic converter to exhaust manifold bolts (1).
5. Remove the oxygen sensor (2).



6. Raise and support the vehicle.
7. Remove the bolts (1), springs and gasket. (Tighten: Exhaust bolts to 60 ± 5 N·m)



8. Remove the catalytic converter retaining bolts (1) & (3) and support isolators (2). (Tighten: Catalytic converter mounting bolts to 60 ± 5 N·m)



9. Remove the catalytic converter.
10. Clean exhaust pipe ends and ensure all exhaust components fit properly.
11. Discard broken or worn isolators, rusted or overused clamps, supports, and attaching parts.
12. Installation is in the reverse order of removal.

Installation Note:

- Replace the gasket between two pipes.

TRANSAXLE
08

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5-SPEED MANUAL TRANSAXLE

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GENERAL INFORMATION

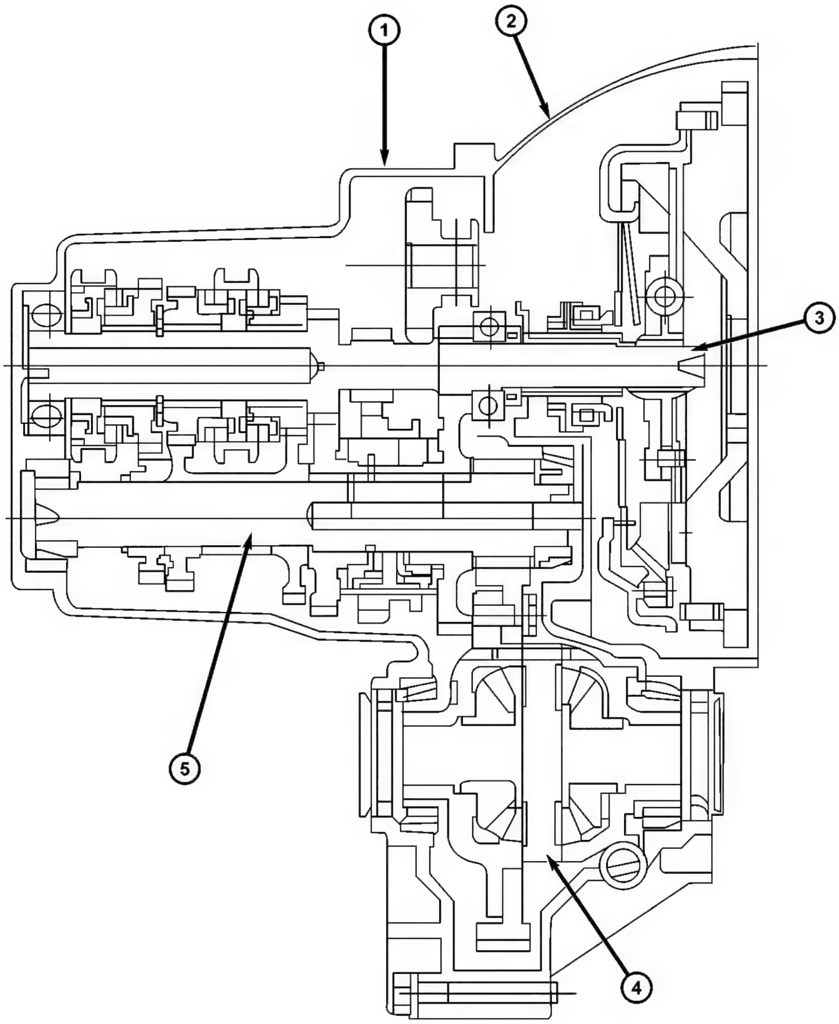
Description

The QR513 five-speed transaxle is a constant-mesh manual transaxle that is synchronized in all gear ranges, including reverse.

The transaxle consists of three major sub-assemblies:
- Input shaft
- Output shaft
- Differential assembly

The transaxle shift system consists of the following components:
- Mechanical shift cover
- Shift rails
- Shift forks
- Shift cables

QR513 Internal View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4
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1 – Transaxle Housing	4 – Output Shaft
2 – Clutch Housing	5 – Differential
3 – Input Shaft	

Operation

The following are the details of the manual transaxle:

Neutral

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. Since no synchronizers are engaged on either the input or output shafts, power is not transmitted to the output shafts and the differential does not turn.

1st Gear

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft first gear is integral to the input shaft, and is in constant mesh with the intermediate shaft first speed gear. Because of this constant mesh, the output shaft first speed gear freewheels until first gear is selected. As the gearshift lever is moved to the first gear position, the 1-2 fork moves the 1-2 synchronizer sleeve towards first gear on the output shaft. The synchronizer sleeve engages the first gear clutch teeth, engaging the gear to the output shaft, and allowing power to transmit through the output shaft to the differential.

2nd Gear

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft second gear is integral to the input shaft, and is in constant mesh with the output shaft second speed gear. Because of this constant mesh, the output shaft second speed gear freewheels until second gear is selected. As the gearshift lever is moved to the second gear position, the 1-2 fork moves the 1-2 synchronizer sleeve towards second gear on the output shaft. The synchronizer sleeve engages the second gear clutch teeth, engaging the gear to the output shaft, and allowing power to transmit through the output shaft to the differential.

3rd Gear

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft third speed gear is in constant mesh with the output shaft 3-4 cluster gear which is fixed to the output shaft. Because of this constant mesh, the input shaft third speed gear freewheels until third gear is selected. As the gearshift lever is moved to the third gear position, the 3-4 fork moves the 3-4 synchronizer sleeve towards third gear on the input shaft. The synchronizer sleeve engages the third gear clutch teeth, engaging the gear to the input shaft, and allowing power to transmit through the output shaft to the differential.

4th Gear

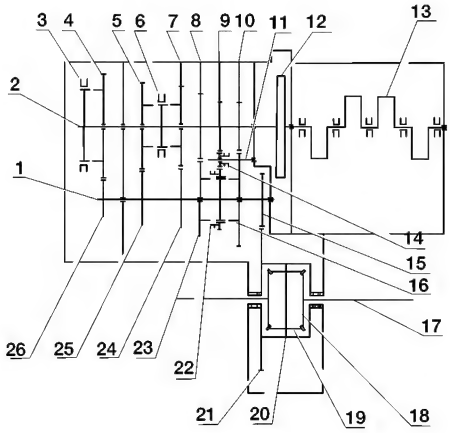
Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft fourth speed gear is in constant mesh with the output shaft 3-4 cluster gear which is fixed to the output shaft. Because of this constant mesh, the input shaft fourth speed gear freewheels until fourth gear is selected. As the gearshift lever is moved to the fourth gear position, the 3-4 fork moves the 3-4 synchronizer sleeve towards fourth gear on the input shaft. The synchronizer sleeve engages the fourth gear clutch teeth, engaging the gear to the input shaft, and allowing power to transmit through the output shaft to the differential.

5th Gear

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft fifth speed gear is pressed on to the input shaft, and is in constant mesh with the output shaft fifth speed gear. Because of this constant mesh, the output shaft fifth speed gear freewheels until fifth gear is selected. As the gearshift lever is moved to the fifth gear position, the 5-R fork moves the 5-R synchronizer sleeve towards the output shaft fifth speed gear. The synchronizer sleeve engages the fifth gear clutch teeth, engaging the gear to the input shaft, and allowing power to transmit through the output shaft to the differential.

Reverse Gear

Engine power is transmitted to the input shaft via the clutch assembly and the input shaft turns. The input shaft reverse gear integral to the input shaft, and is in constant mesh with the reverse idler gear. The reverse idler gear, which reverses the rotation of the output shaft, is in constant mesh with the output shaft reverse gear. Because of this constant mesh, the output shaft reverse gear freewheels until reverse gear is selected. As the gearshift lever is moved to the reverse gear position, the 5-R fork moves the 5-R synchronizer sleeve towards the output shaft reverse gear. The synchronizer sleeve engages the reverse gear clutch teeth, engaging the gear to the output shaft, and allowing power to transmit through the output shaft to the differential.



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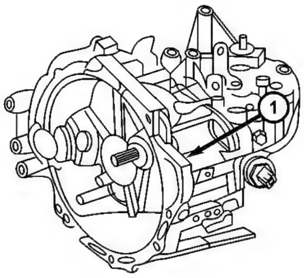
1 – Output Shaft	14 – Idler Gear
2 – Input Shaft	15 – Differential Driving Gear
3 – 5th Gear Synchronizer	16 – 1st Driven Gear
4 – 5th Driving Gear	17 – Axle Shaft
5 – 4th Driving Gear	18 – Differential Side Gear
6 – 3rd & 4th Gear Synchronizer	19 – Pinion Gear
7 – 3rd Driving Gear	20 – Differential Case
8 – 2nd Driving Gear	21 – Differential Driven Gear
9 – Reverse Driving Gear	22 – 1st & 2nd Gear Synchronizer
10 – 1st Driving Gear	23 – 2nd Driven Gear
11 – Idler Gear Shaft	24 – 3rd Driven Gear
12 – Clutch	25 – 4th Driven Gear
13 – Crankshaft	26 – 5th Driven Gear

Transaxle Identification-Number

The transaxle serial number can be found on a metal tag (1) fastened to the transaxle case on the clutch housing. The third row data is transaxle serial number.



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Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Differential Driven Gear Bolt	130 ± 5
Drain Plug	44 ± 3
Transaxle External Housing-to-Case Bolts	25 ± 2
Fork Shaft Seat	40 ± 5
End Cover Bolt	20 ± 2
Reverse Idler Shaft-to-Case Bolt	38 ± 2.5
Reverse Fork Mechanism Bolt	25 ± 2
Reverse Lamp Switch Assembly	20 ± 2
Clutch Release Fork Bolt	20 ± 2
Gear Shift Mechanism Assembly Bolt	32 ± 2.5
Reverse Lock Mechanism Bolt	18 ± 2
Engine To Transaxle Bolts	70 ± 5

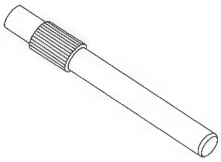
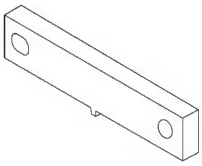
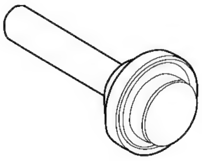
Gear Ratio Specifications

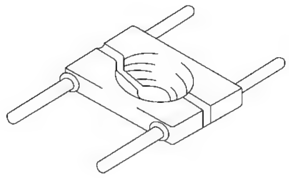
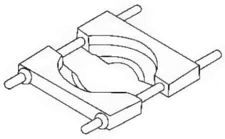
GEAR	RATIO
1st	3.545
2nd	2.05
3rd	1.423
4th	1.065
5th	0.865
Reverse	3.364
Speedometer	0.806
Final Drive Ratio	4.056

Lubrication Specifications

DESCRIPTION	ITEM
Transaxle Fluid Quantity	1.8L
Fluid Type	75W-90 GL-4

Special Tools

Clutch Pressure Plate Installer CH-20014	 besm080041
Flywheel Fixture CH-20009	 besm080040
Differential Seal Installer CH-30002	 besm080043

Bearing Remover MB-998801	 ltsm080006
Bearing Remover MB-998917	 ltsm080018

DIAGNOSIS & TESTING

Abnormal Noise

Transaxle noise is most often a result of worn or damaged components. Chipped, broken gear or synchronizer teeth, and worn bearings all cause noise.

Inspect for the following:
- Insufficient lubrication
- Incorrect lubricant
- Mis-assembled or damaged internal components
- Improper operation

Symptom Diagnostics

Hard Shifting

- Hard shifting may be caused by a mis-adjusted crossover cable. If hard shifting is accompanied by gear clash, synchronizer clutch and stop rings or gear teeth may be worn or damaged.

Slips Out Of Gear

- Transaxle disengagement may be caused by misaligned or damaged shift components, or worn teeth on the drive gears or synchronizer components. Incorrect assembly of the transaxle could also cause gear disengagement.

Low Lubricant Level

- Insufficient transaxle lubricant is usually the result of leaks, or inaccurate fluid level check or refill method. Vehicle must be level to accurately check fluid level. Leakage is evident by the presence of oil around the leak point. If leakage is not evident, the condition is probably the result of an under fill.
- If air–powered lubrication equipment is used to fill a transaxle, be sure the equipment is properly calibrated. Equipment out of calibration can lead to an under fill condition.

Clutch Problems

- Worn, damaged, or misaligned clutch components can cause difficult shifting, gear clash, and noise.
- A worn or damaged clutch disc, pressure plate, or a faulty slave cylinder can cause hard shifting and gear clash.

Abnormal Noise

- Transaxle noise is most often a result of worn or damaged components. Chipped, broken gear or synchronizer teeth, and worn bearings all cause noise.

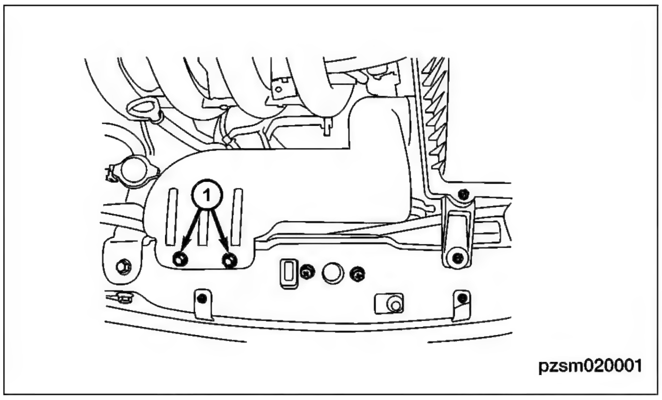
  Inspect the following:
  - Insufficient lubrication
  - Incorrect lubricant
  - Improperly assembled or damaged internal components

ON-VEHICLE SERVICE

Manual Transaxle

Removal & Installation

1. Raise and support the vehicle.
2. Remove the air intake pipe retaining bolts (1). (Tighten: Air intake pipe bolts to 8 ± 3 N·m)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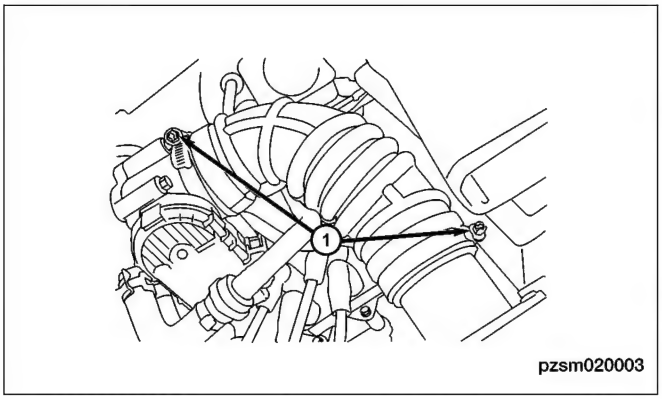
3. Remove the clamps (1) on each side of the intake manifold hose.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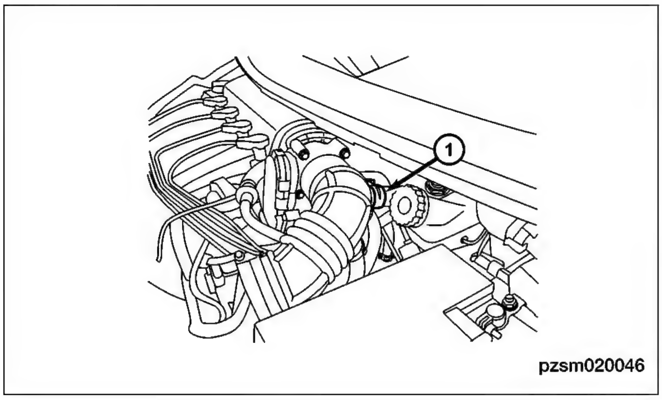
4. Remove the clamp (1) on the intake manifold hose.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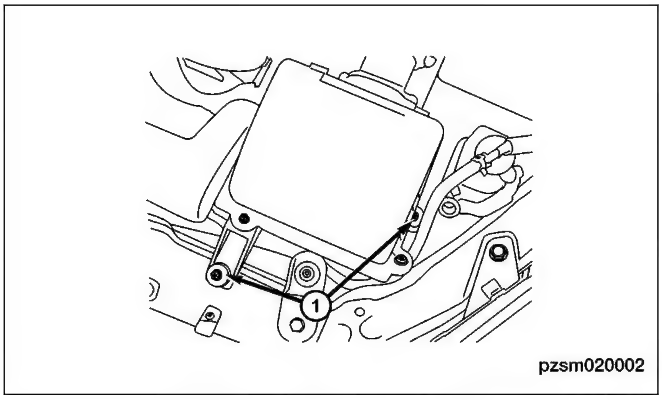
5. Remove the intake manifold hose.

6. Remove the air cleaner housing retaining bolts (1). (Tighten: Air intake pipe bolts to 10 ± 5 N·m)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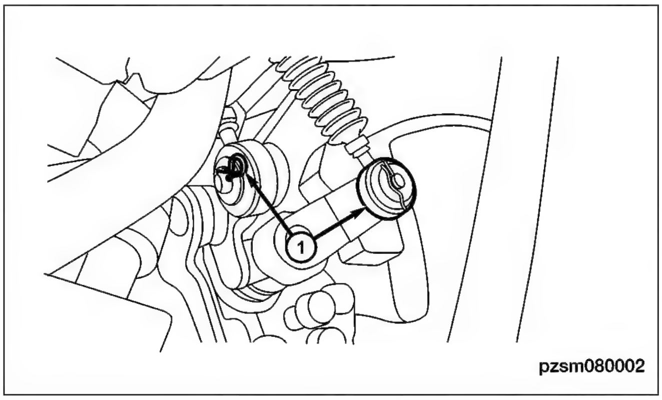
7. Remove the air cleaner housing assembly.
8. Remove the battery and battery tray (See Battery Removal & Installation in Section 05 Starting & Charging).
9. Remove the two shift cables (1) from the transaxle.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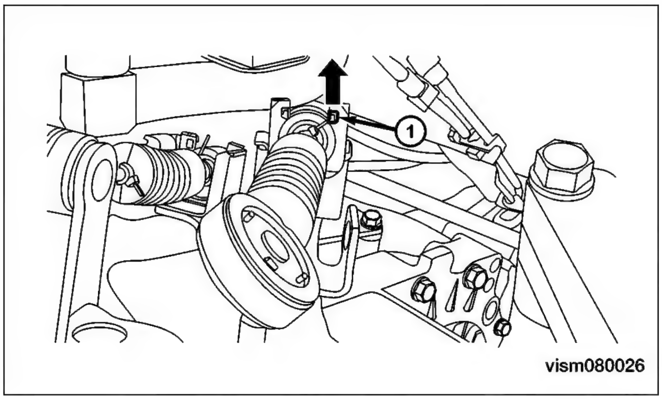
10. Remove the shift cable clamp (1) from the shift cable bracket.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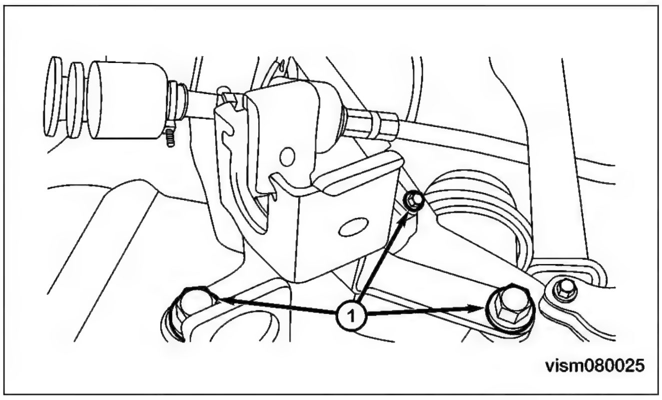
11. Remove the shift cable bracket retaining bolts (1).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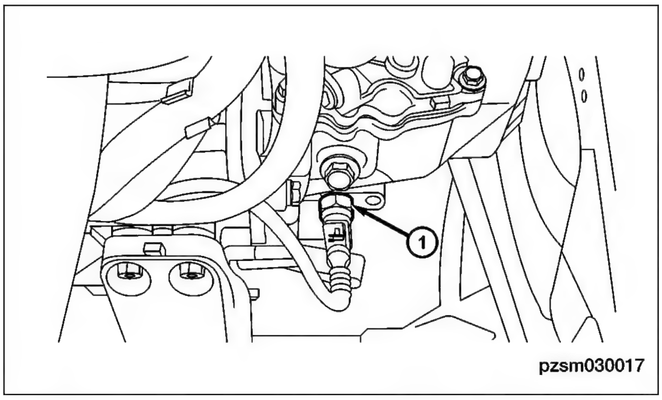
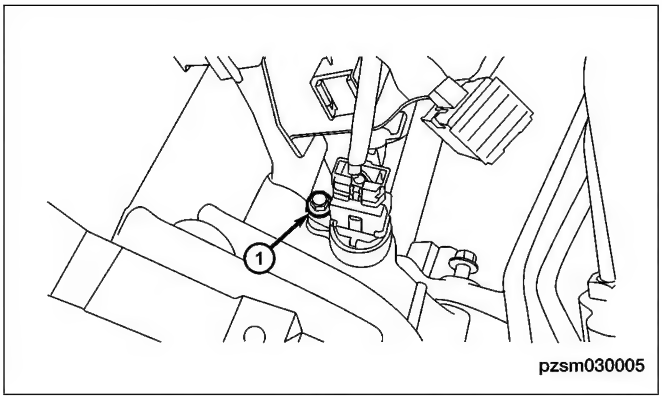
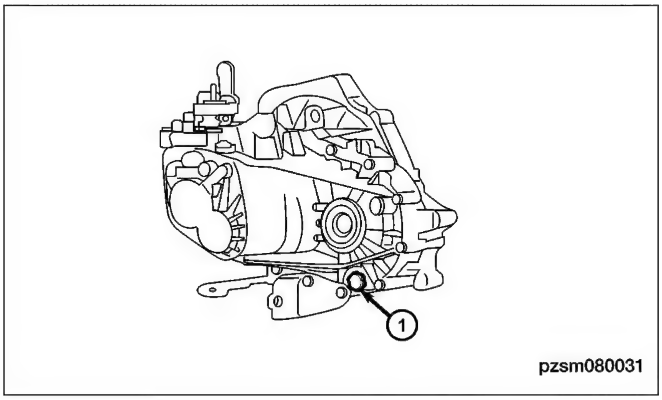
12. Disconnect the electrical connectors for the backup lamp switch (1).



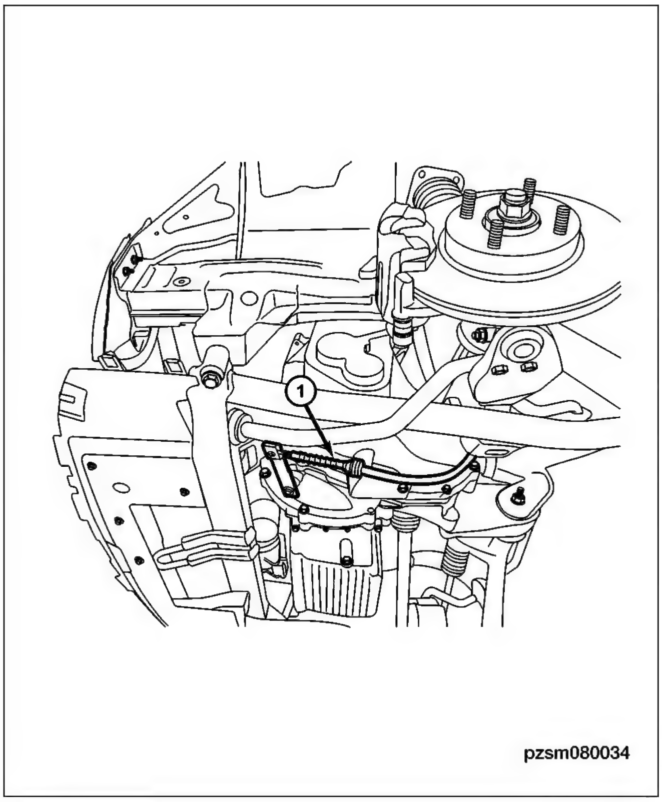
13. Disconnect the vehicle speed sensor electrical connectors (1).



14. Remove starter motor (See Starter Removal & Installation in Section 05 Starting & Charging).
15. Remove both front axle shafts (See Front Axle Shaft Removal & Installation in Section 09 Axle).
16. Support the engine using an engine support fixture or suitable jack.
17. Raise the vehicle.
18. Remove the engine undercover and splash shields.
19. Remove the drain plug (1) and drain the transaxle fluid.



20. Disconnect the clutch cable (1) from the clutch housing and position it aside.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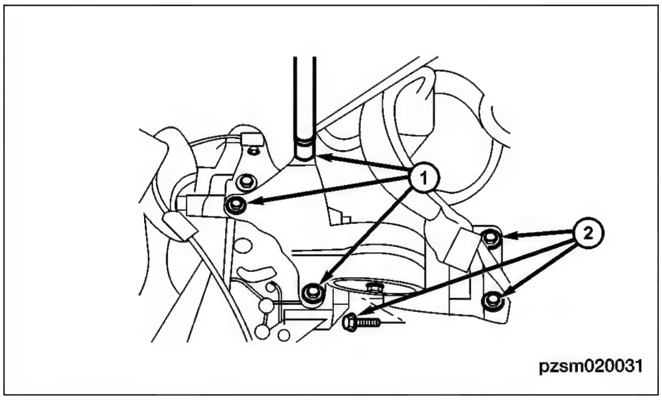
21. Remove the left transaxle mount bolts (1) and bracket bolts (2).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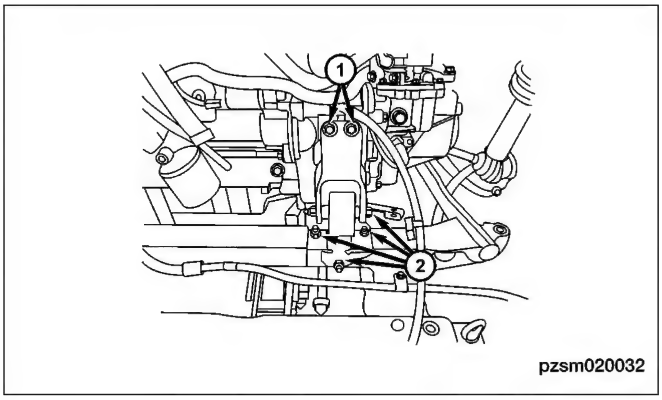
22. Remove the transaxle front mount bolts (1) and bracket bolts (2).
(Tighten: Transaxle front mount bolts to 80 ± 5 N·m)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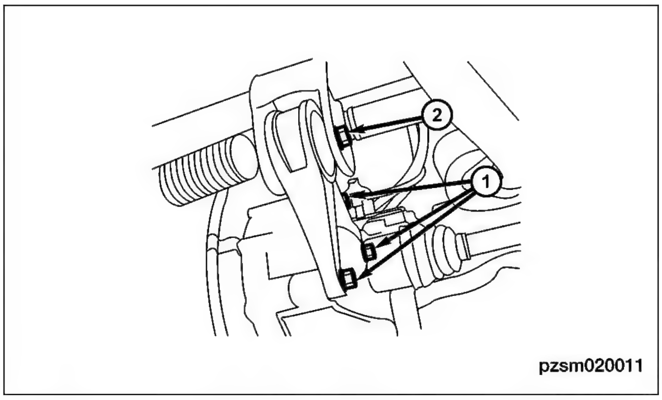
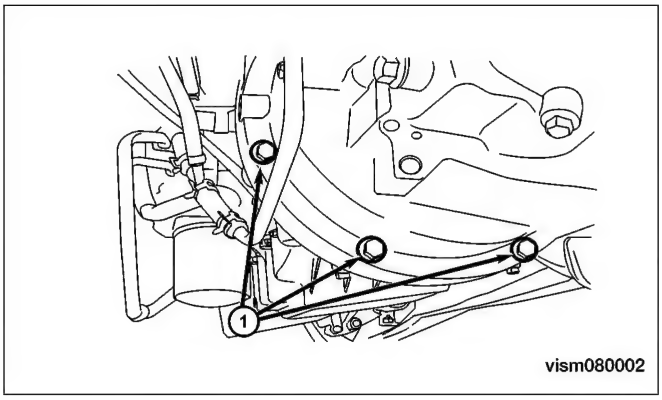
23. Remove the transaxle rear mount bolt (2) and bracket bolts (1).
    (Tighten: Transaxle rear mount bolts to 60 ± 5 N·m)



24. Remove the engine to transaxle bolts (1).
    (Tighten: Engine to transaxle bolts to 70 ± 5 N·m)



25. Remove the sub-frame assembly (See Sub-Frame Removal & Installation in Section 11 Steering).
26. Separate the transaxle from the engine and remove it from the vehicle.

WARNING!

Support the transaxle with a suitable jack while removing the transaxle.

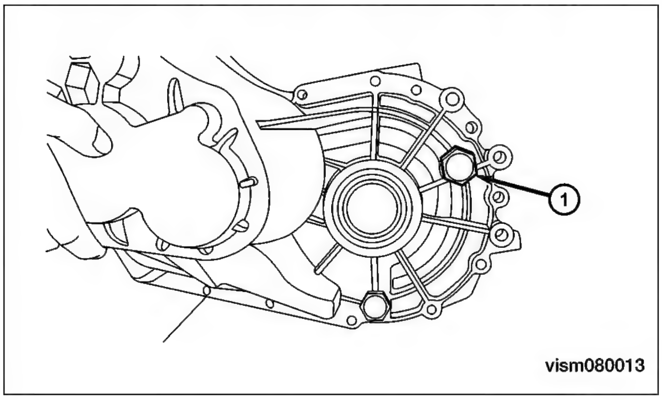
27. Installation is in the reverse order of removal.

Installation Notes:

- When installing the transaxle, be careful to avoid interference between the transaxle input shaft and the clutch.
- After transaxle installation, remove the fill hole plug (1) and fill the transaxle fluid to the proper level.

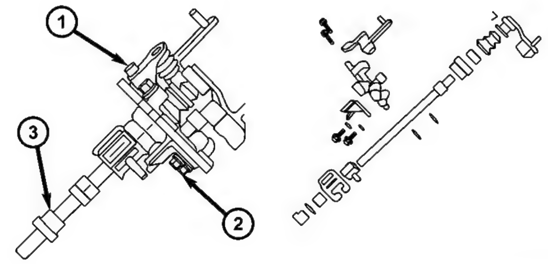
NOTE :
When filling the transaxle with fluid, fill the transaxle until the fluid is even with the fill hole plug.

- Transaxle fluid quantity: 1.8L



Gear Selector & Shifter Assembly

Removal & Installation



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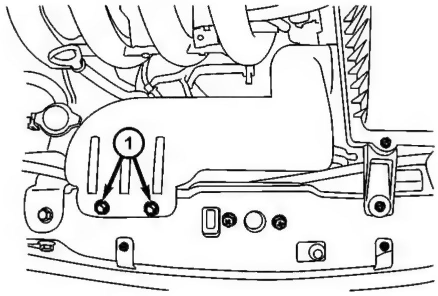
1 – Gearshift Arm Bracket Bolts	3 – Split Washer
2 – Reverse Gear Lockup Mechanism Bolts	

1. Raise and support the vehicle.
2. Disconnect the negative battery cable.
3. Remove the retaining bolts (1) from the air intake pipe.
   (Tighten: Air intake pipe bolts to 8 ± 3 N·m)



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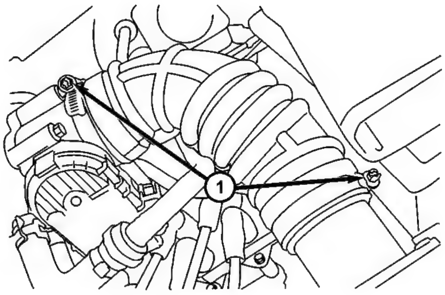
4. Remove the clamps (1) on each side of the intake manifold hose.



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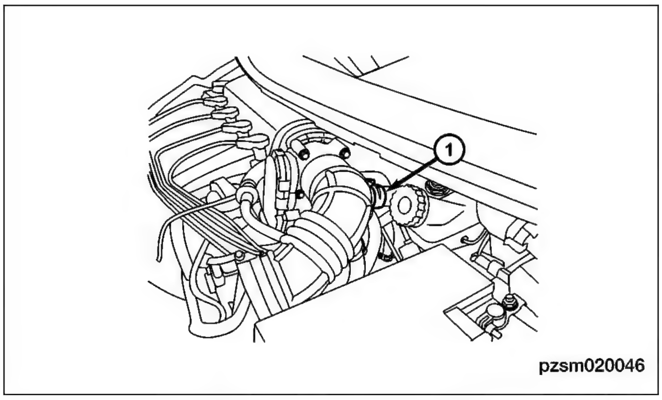
5. Remove the clamp (1) on the intake manifold hose.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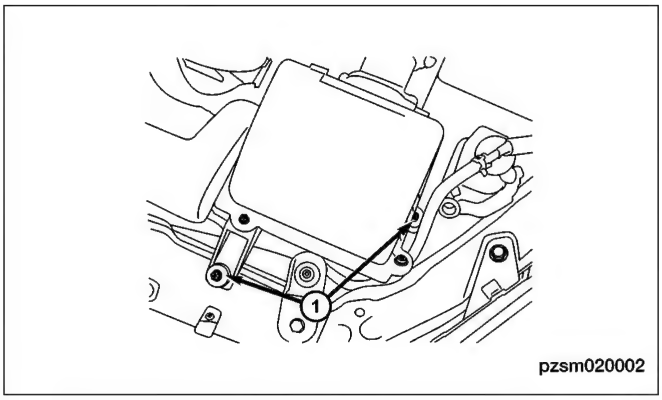
6. Remove the intake manifold hose.
7. Remove the air cleaner housing retaining bolts (1). (Tighten: Air intake pipe bolts to 10 ± 5 N·m)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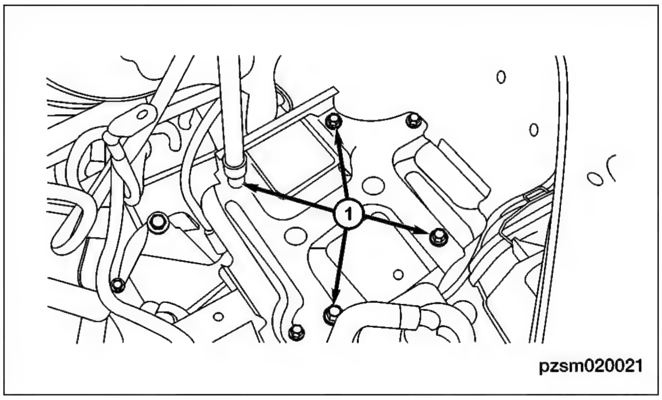
8. Remove the air cleaner housing.
9. Remove the battery and battery tray retaining bolts (1) (See Battery Removal & Installation in Section 05 Starting & Charging).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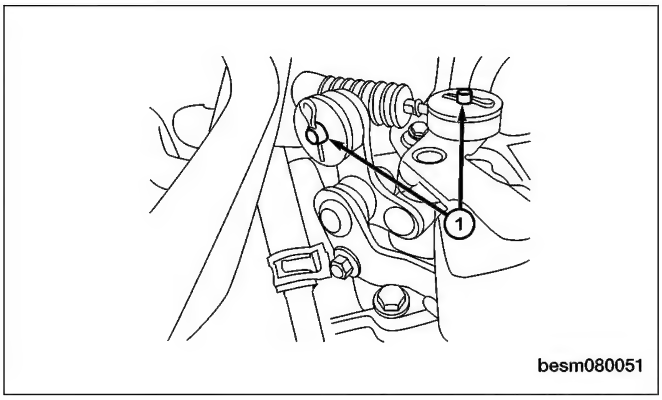
10. Remove the two shift cables (1) from the transaxle.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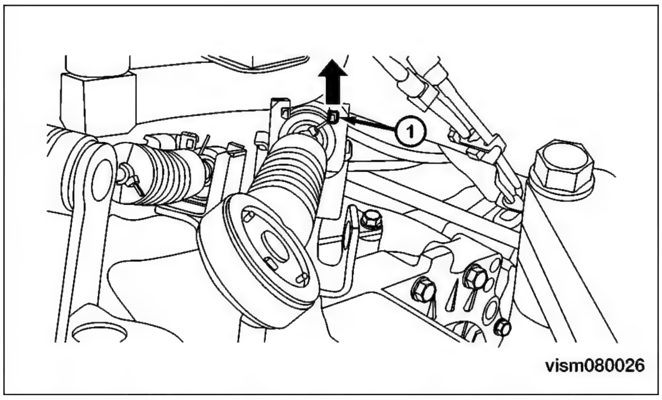
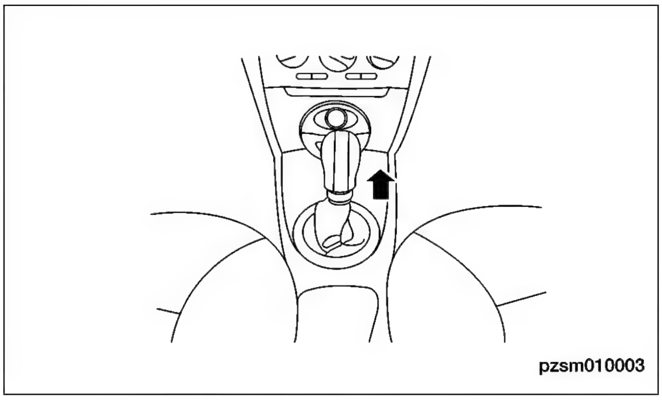
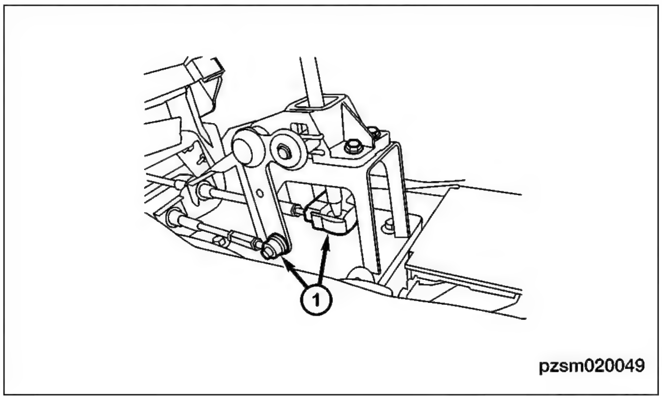
11. Remove the shift cable clamp (1) from the shift cable bracket.



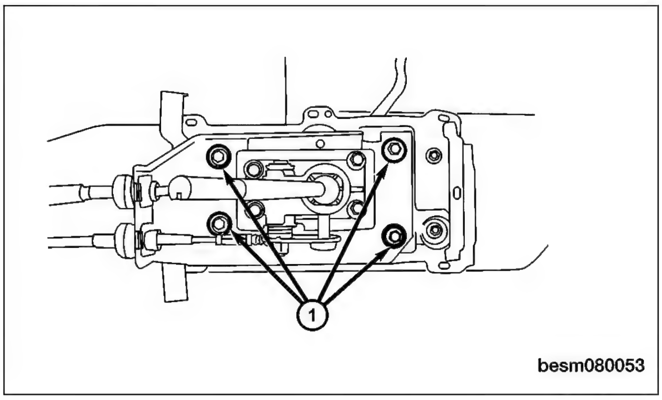
12. Remove the gearshift knob.
13. Remove the gearshift boot from the lower console.



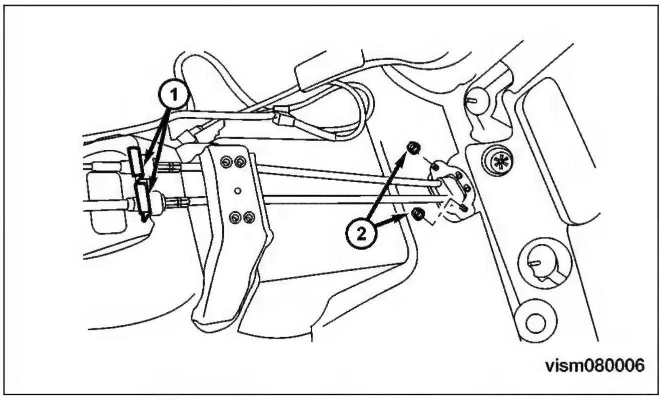
14. Apply the parking brake (apply parking brake handle to clear lower console upon removal).
15. Remove the lower console (See Lower Console Removal & Installation in Section 15 Body).
16. Remove the crossover cable and the selector cable (1) from the gearshift mechanism.



17. Remove the four bolts (1) and then remove the gearshift mechanism from the bracket.

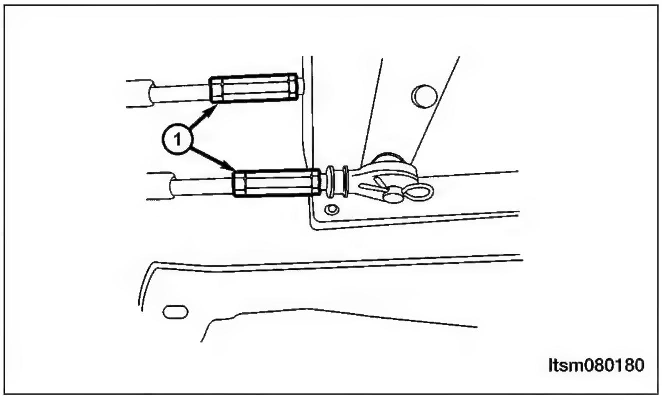


18. Remove the selector cable clamps (1) and bracket retaining bolts (2).
19. Remove the gear selector & shift cable assembly.



20. Installation is in the reverse order of removal.

NOTE :
Selector cables can be adjusted with the adjustment bolt (1).



TRANSAXLE UNIT REPAIR

Transaxle

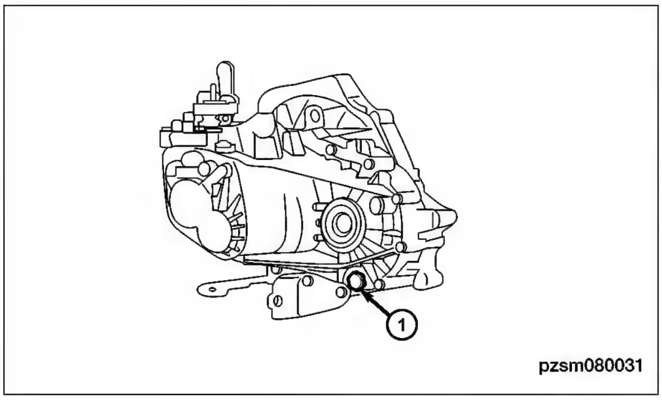
Specifications

Torque Specifications

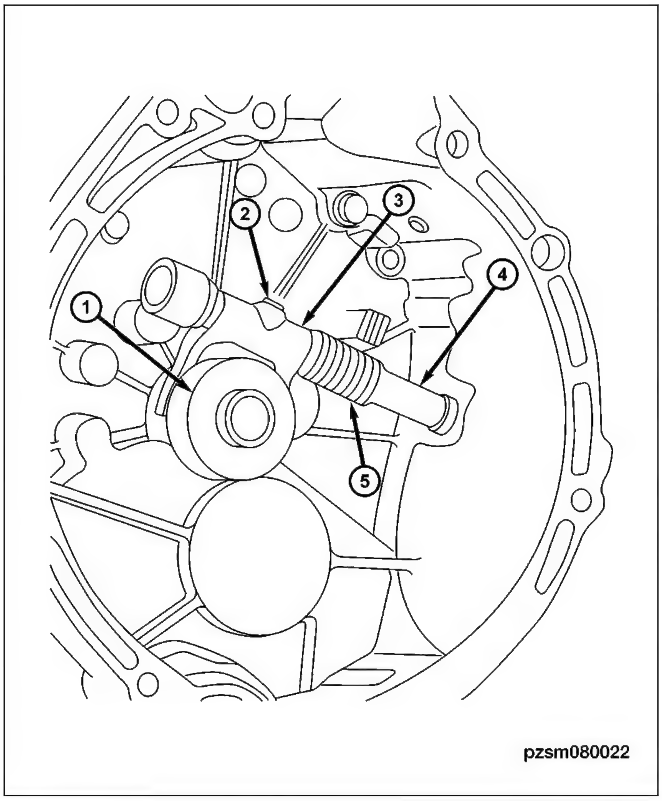
DESCRIPTION	TORQUE (N·m)
Differential Driven Gear Bolt	130 ± 5
Drain Plug	44 ± 3
Fork Shaft Seat	40 ± 5
Reverse Idler Shaft-to-Case Bolt	38 ± 2.5
Reverse Fork Mechanism Bolt	25 ± 2
Reverse Lamp Switch Assembly	20 ± 2
Gear Shift Mechanism Assembly Bolts	25 ± 2.5
Reverse Lock Mechanism Bolt	18 ± 2

Disassembly

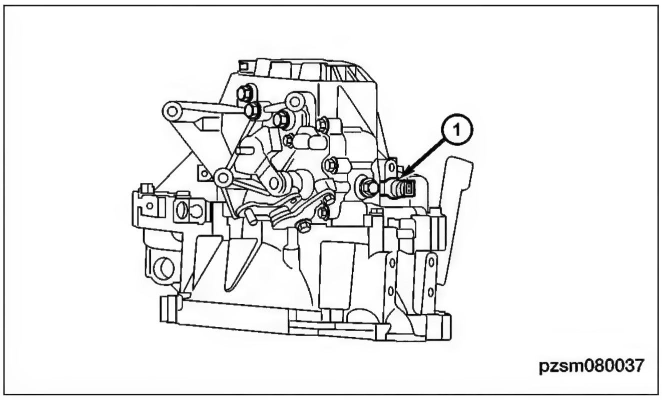
1. Remove the oil drain plug (1) and drain the transaxle oil.
   (Tighten: Drain Plug to 44 ± 3 N·m)
2. Place the transaxle on a work bench.



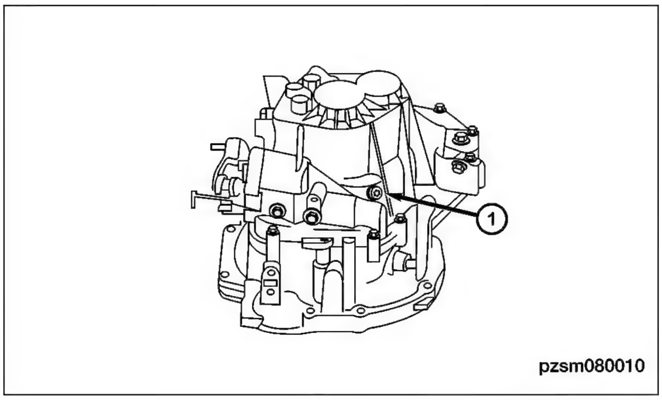
3. Remove the release arm bolt (2) and release the return torsion spring (5).
   (Tighten: Release arm bolt to 20 ± 2 N·m)
4. Remove the release shaft assembly (4) and remove the release fork (3).
5. Remove the release bearing (1).



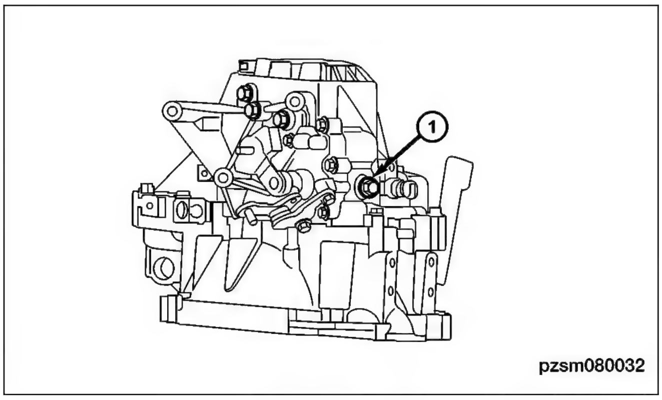
6. Engage the transaxle to neutral position.
7. Remove the backup lamp switch (1).
   (Tighten: Backup lamp switch to 20 ± 2 N·m)



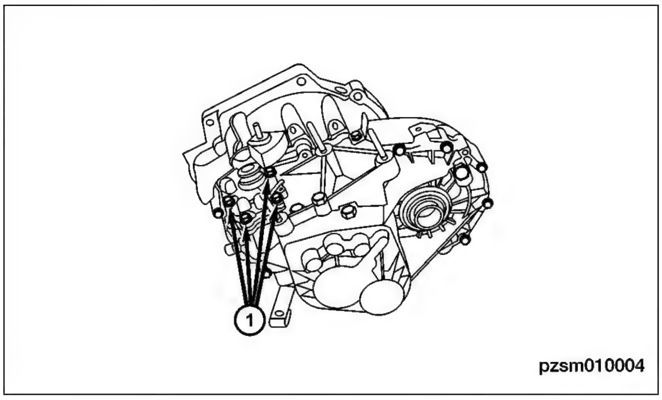
8. Remove the idle gear shaft retaining bolt (1).
   (Tighten: Idle gear shaft bolt to 38 ± 2.5 N·m)



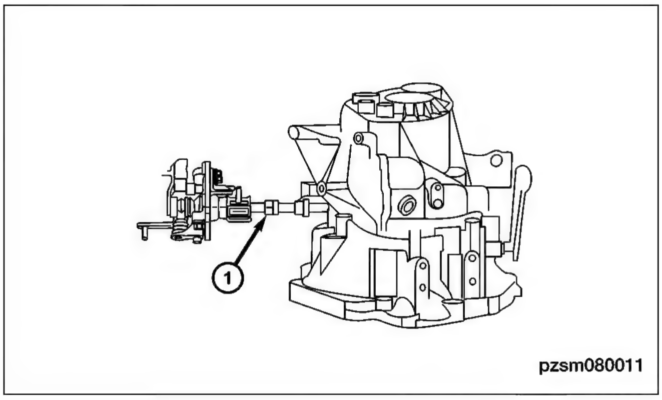
9. Remove the locating seat of fork shaft bolt (1).
(Tighten: Gearshift housing bolts to 32 ± 2.5 N·m)



10. Remove the gearshift mechanism locating seat retaining bolts (1).

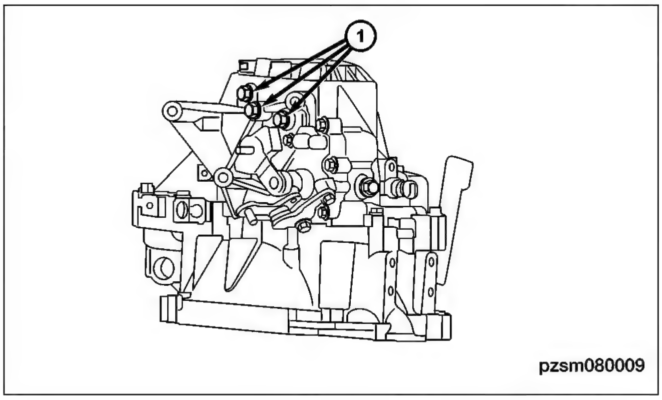


11. Separate the gearshift mechanism assembly (1) from transaxle housing.

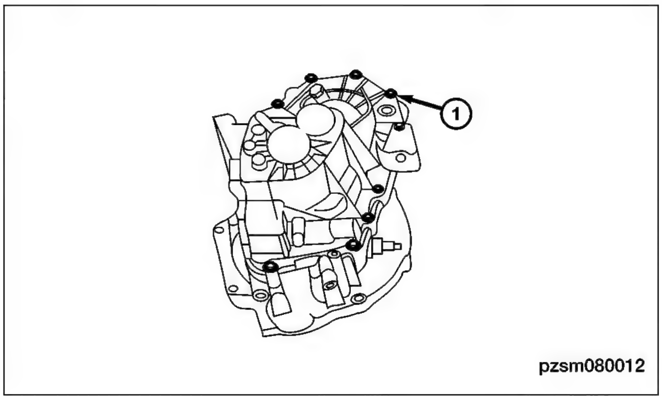


12. Remove the three locating seat retaining bolts (1) of the 3rd-4th fork shaft, reverse fork shaft and the 1st-2nd fork shaft.
(Tighten: Fork shaft seat bolts to 44 ± 3 N·m)

NOTE: The 1st-2nd location bolt is longer.



13. Remove the seventeen exterior connecting bolts (1) for clutch housing and transaxle housing.
    (Tighten: Clutch housing and transaxle housing bolt to 25 ± 2 N·m)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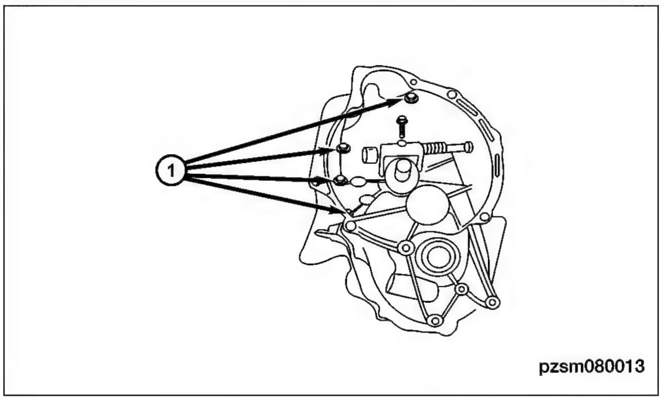
14. Remove the four interior connecting bolts (1) for clutch housing and transaxle housing.
    (Tighten: Clutch housing and transaxle housing bolt to 25 ± 2 N·m)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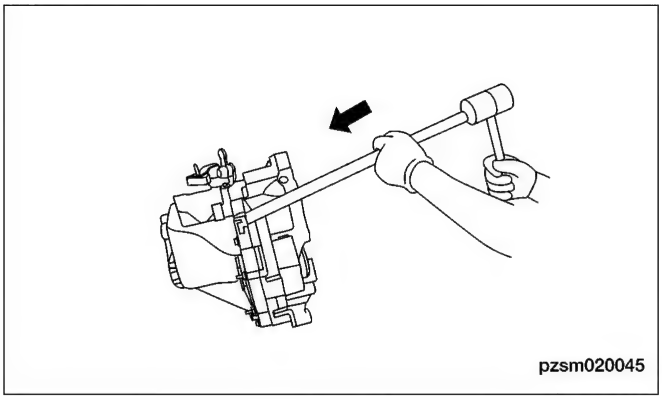
15. Using a copper bar, tap the transaxle housing.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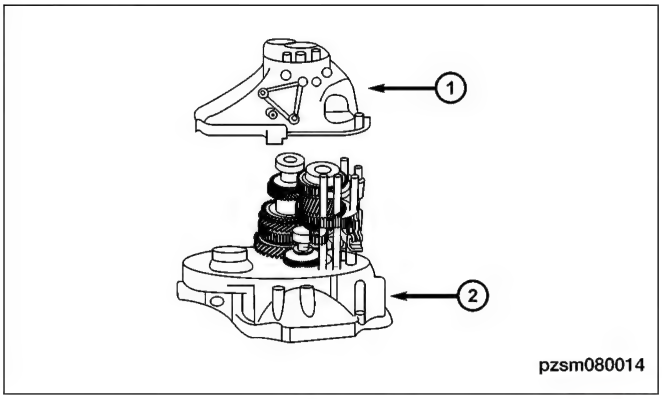
16. Separate the transaxle housing (1) from clutch housing (2).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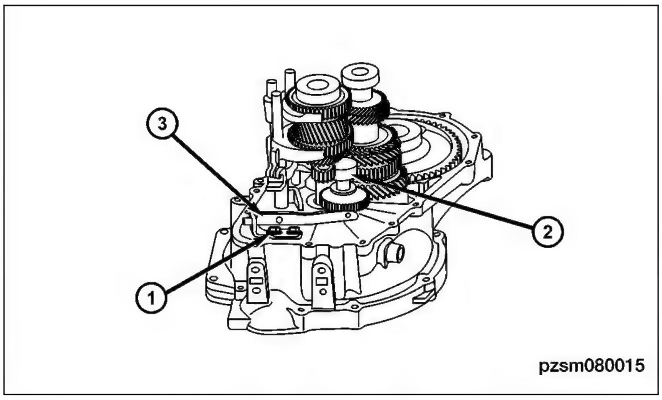
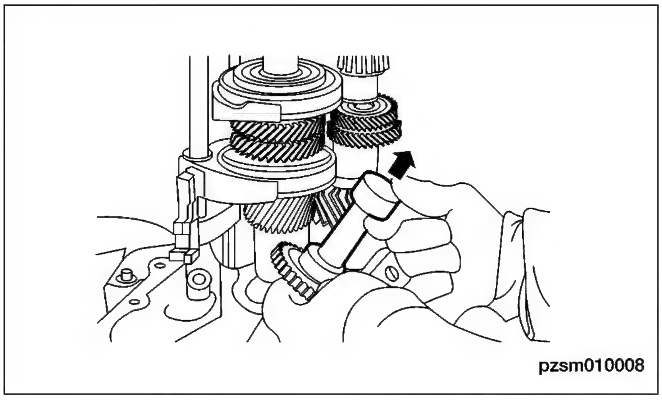
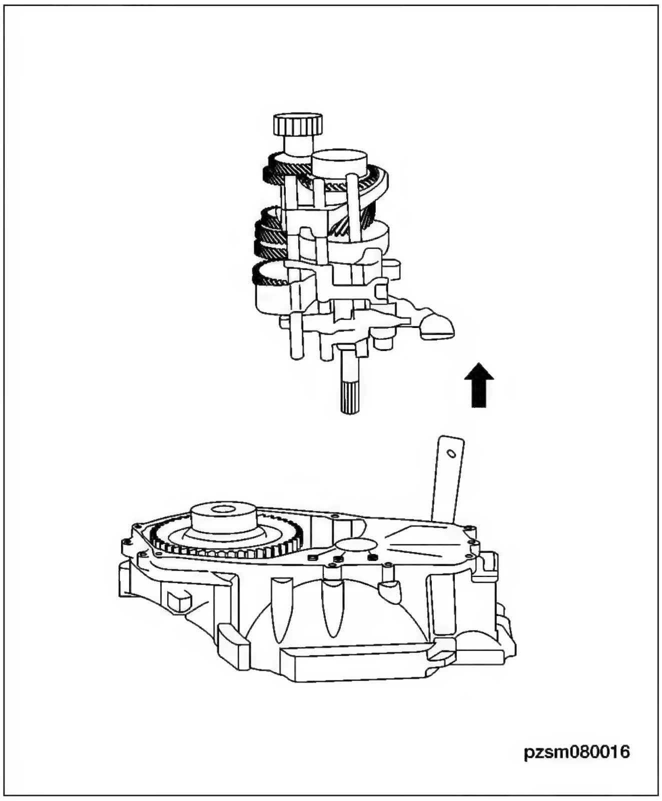
17. Remove the bolts (1) for the reverse gear rocker arm (3) bracket and remove the reverse gear rocker arm assembly and the pin on idler drive (2). (Tighten: Reverse gear rocker arm bolt to 18 ± 2 N·m)



18. Separate the reverse idle gear from idle gear shaft and take off the idle gear gasket.



19. Remove the input shaft, output shaft and fork mechanism together.
20. Separate the 3rd-4th gear shift fork and shift fork rail, 5th-reverse gear shift fork and shift fork rail from input and output shaft together.



Assembly

1. Assemble in the reverse order of disassembly.

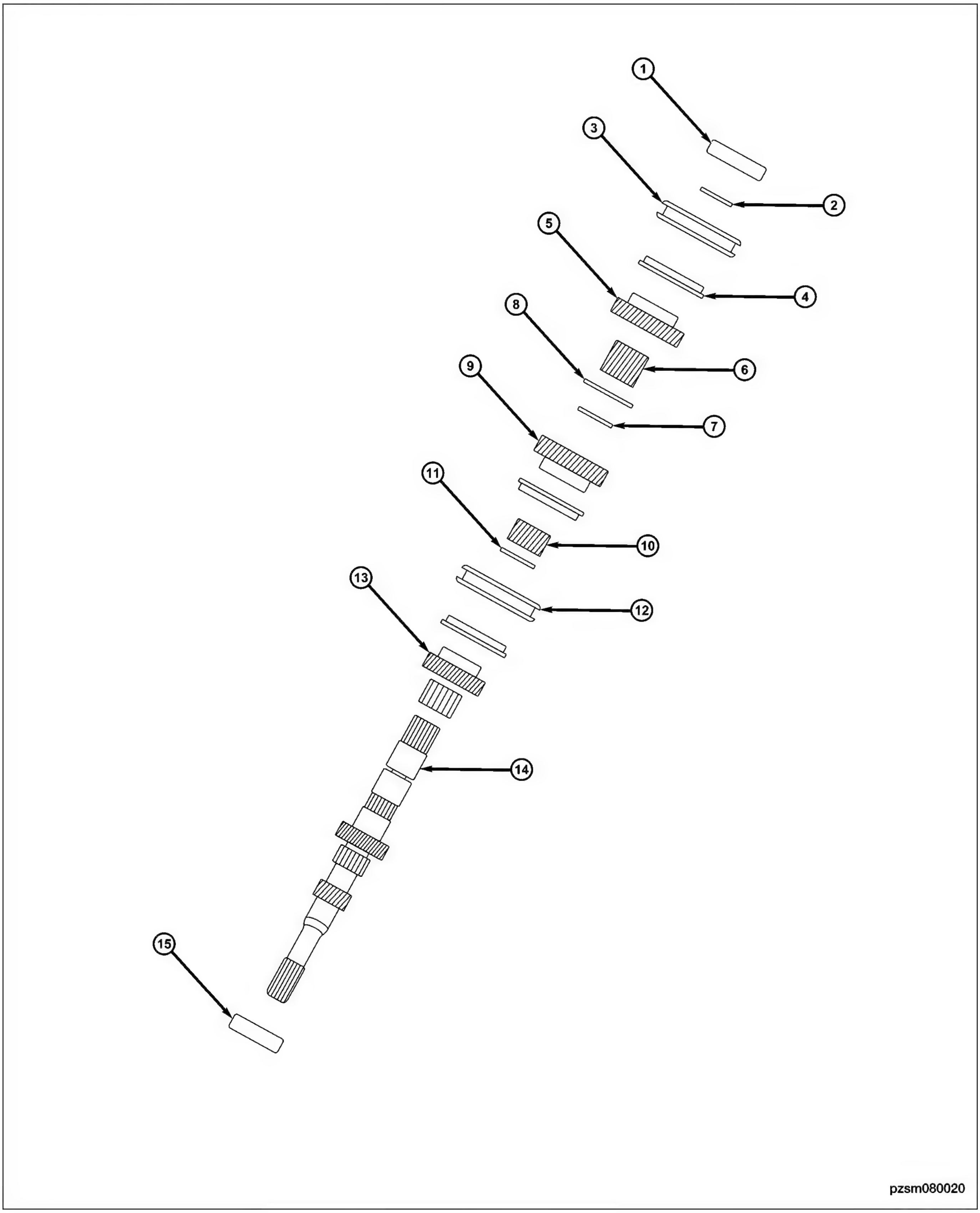
Input Shaft

Specifications

Clearance Specifications

SYNCHRONIZER RING	VALUE OF ″A″ (mm)	WEARING LIMIT (mm)
1st-2nd Gear	1.10 - 1.17	0.05
3rd-4th Gear	1.35 - 1.90	0.05
5th Gear	1.10 - 1.17	0.05

Disassembly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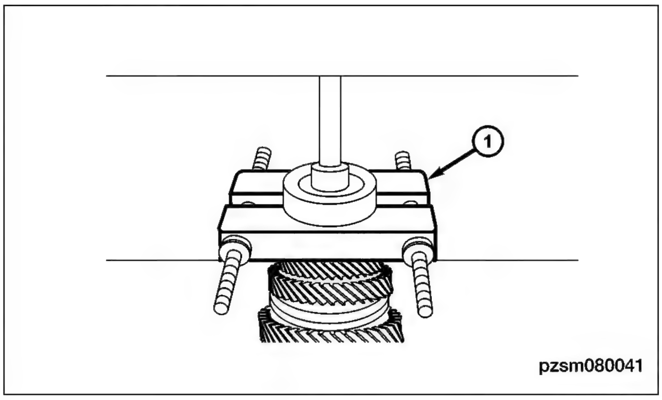
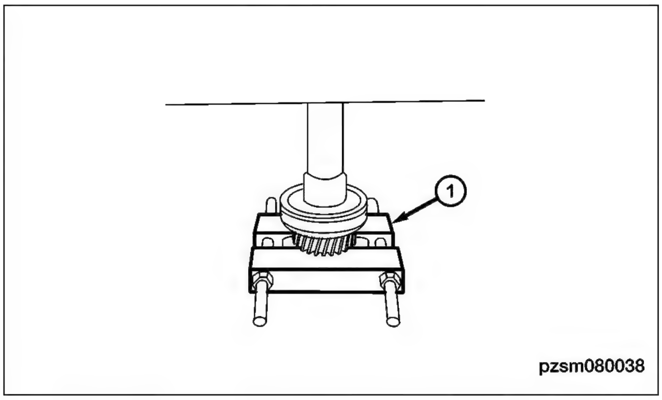
1- Front Input Shaft Bearing	9 - 4th Gear Driving Gear
2 - Rear Snap Ring	10 - 3rd-4th Gears Needle Bearing
3 - 5th Gear Synchronizer Assembly	11 - Front Snap Ring
4 - Synchronizer Ring	12 - 3rd-4th Gears Synchronizer Assembly
5 - 5th Gear Driving Gear	13 - 3rd Gear Driving Gear
6 - 5th Gear Needle Bearing	14 - Input Shaft
7 - Gear Baffle	15 - Rear Input Shaft Bearing
8 - Gear Baffle Thrust Clamp Hoop	

1. Using special tool MB-998801 (1), remove the input shaft bearing from the rear end of input shaft.

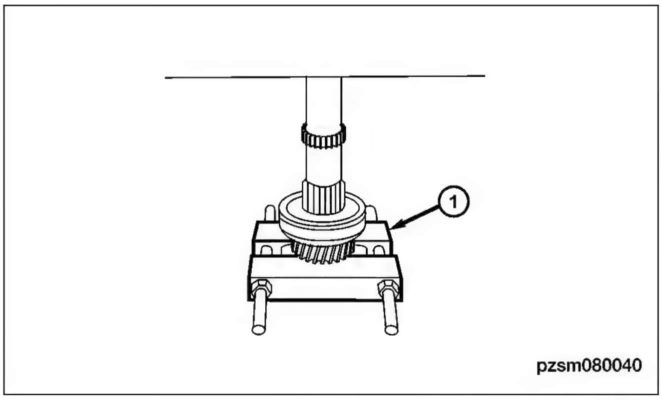


2. Using snap-ring pliers remove the rear snap ring.
3. Remove the rear adjuster shim from the rear bearing.
4. Using special tool MB-998817 (1), remove the 5th gear synchronizer assembly with a press.

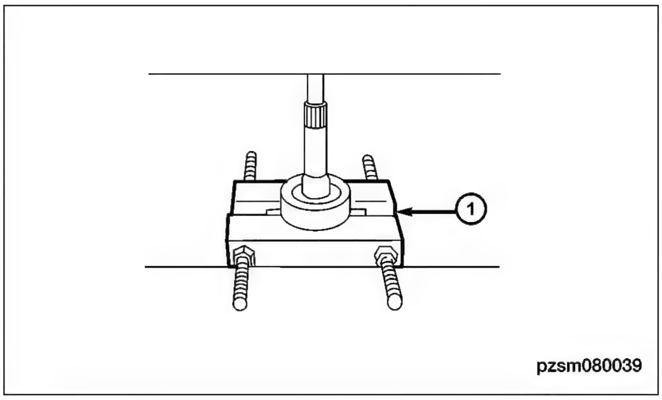


5. Separate the 5th driving gear.
6. Remove 5th needle roller bearing.
7. Remove the gear baffle thrust clamp hoop and remove the gear baffle.
8. Remove the 4th driving gear.
9. Remove the 3rd and 4th needle roller bearing.
10. Remove 3rd-4th gear synchronizer.
11. Using snap-ring pliers remove the front snap ring.

12. Using special tool MB-998817 (1), remove the 3rd-4th gear synchronizer assembly with press.

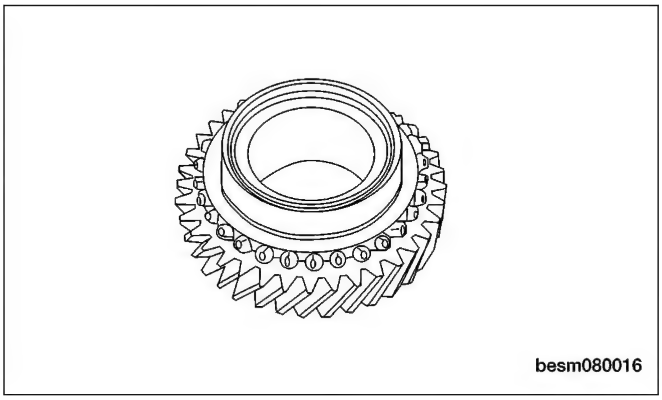


13. Remove the synchronizer ring.
14. Remove the 3rd driving gear.
15. Remove the 3rd-4th needle roller bearing.
16. Using special tool MB-998817 (1), remove the input shaft bearing from the front end of input shaft.

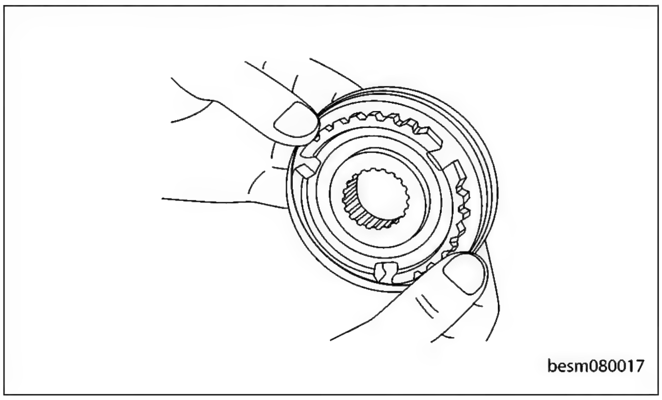


Inspection

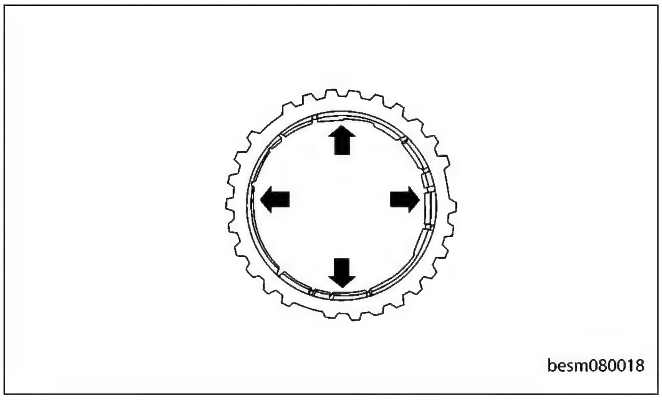
1. Clean all components.
2. Inspect the input shaft for the following:
    - Any damage, abnormal wear or lockup of the needle roller bearings.
    - Any damage or wear of the spline.
    - Correct gears for the transaxle assembly.
    - Smooth rotation of gears.
    - Any part looseness or noise.
3. Inspect the 3rd and 4th driving gears for the following:
    - Any damage or wear on the tooth surfaces of helical gear and clutch gear.
    - Any damage, wear or coarsening on the synchronizer's conical surface.
    - Any damage or wear on the inner-diameter, front and rear surfaces.



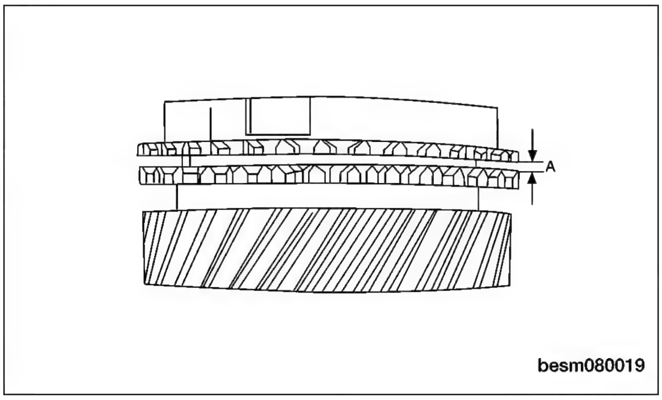
4. Inspect the gear sleeve and gear hub of the 3rd-4th gear synchronizer:
   - Assemble the gear sleeve and gear hub together and check whether they can slide smoothly or whether they are locked up as shown.



5. Disassemble the gear sleeve:
   - Inspect for any damage in the front and rear of the gear sleeve's inner surface.
6. Inspect for any damage or wear on the gear tooth surfaces of the synchronizer ring, whether there is any damage or wear on the inner-diameter surface of the synchronizer's conical portion, and whether the screw thread is damaged due to crushing.



7. Press the synchronizer rings onto their respective gears' conical surfaces and check the values of clearance ″A″. The standard values of ″A″ are as shown in the following table:



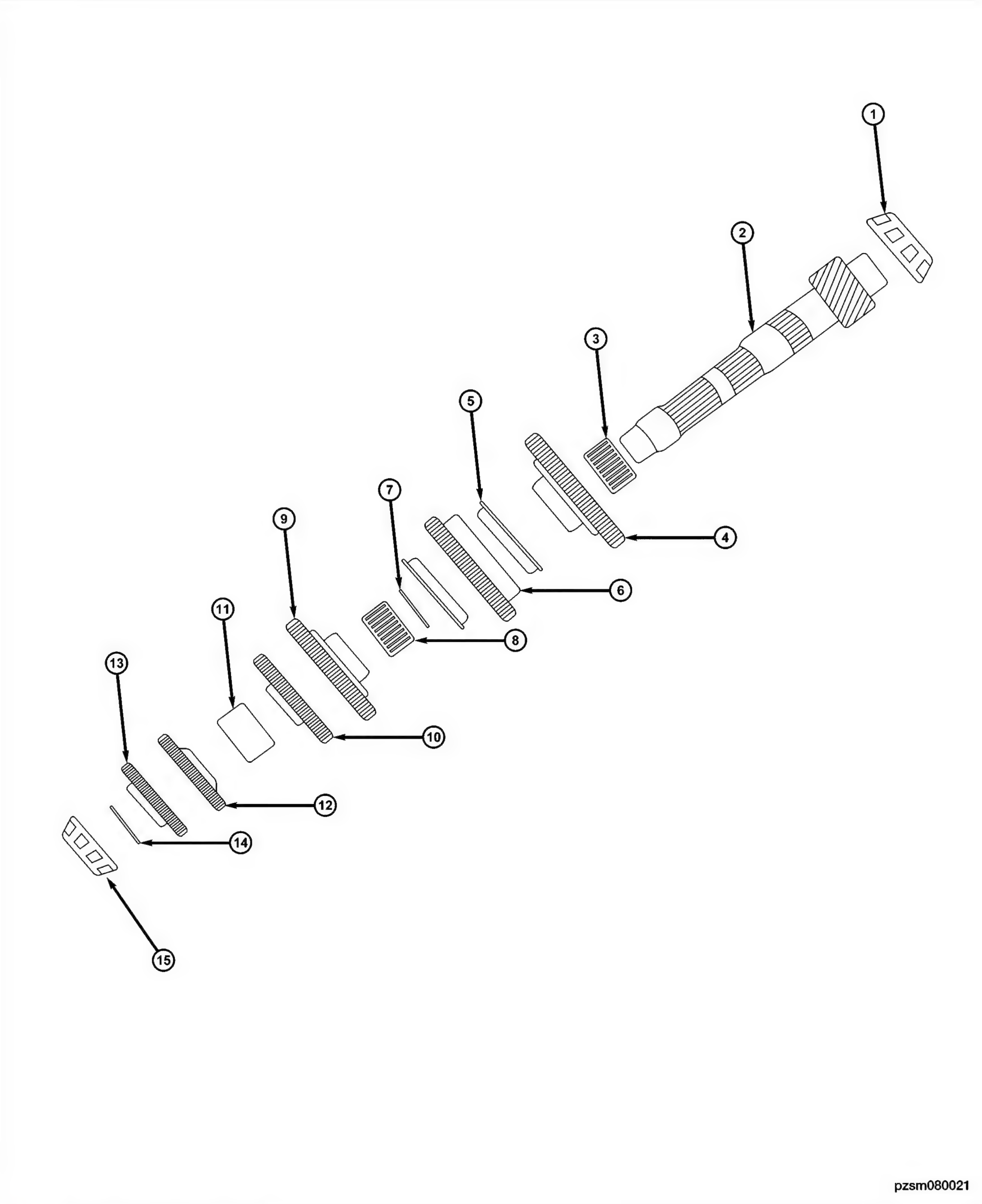
SYNCHRONIZER RING CLEARANCE		
SYNCHRONIZER RING	VALUE OF ″A″ (mm)	WEARING LIMIT (mm)
1st-2nd Gear	1.10 - 1.17	0.05
3rd-4th Gear	1.35 - 1.90	0.05
5th Gear	1.10 - 1.17	0.05

Assembly

1. Assemble in the reverse order of disassembly.

Output Shaft

Disassembly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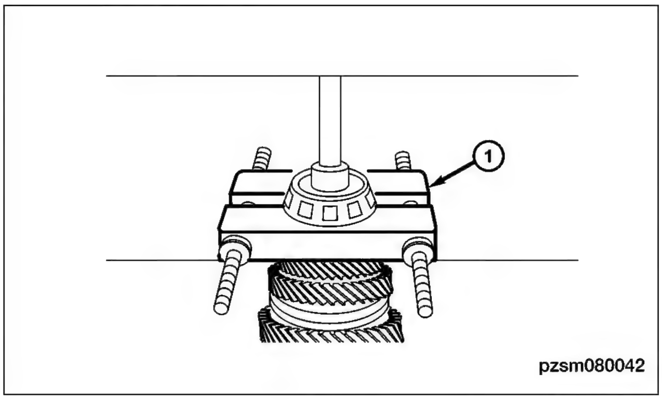
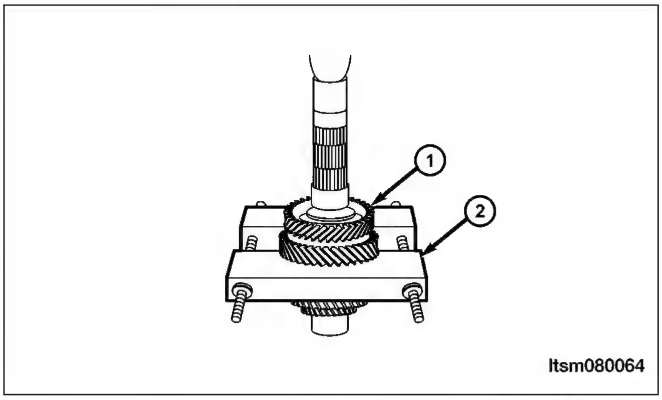
1 – Front Bearing Of Output Shaft	9 – 2nd Gear Driven Gear Assembly
2 – Output Shaft	10 – 3rd Gear Driven Gear
3 – 1st-2nd Needle Roller Bearing	11 – Gear Spacer
4 – 1st Driven Gear	12 – 4th Gear Driven Gear
5 – 1st-2nd Gear Synchronizer Ring	13 – 5th Gear Driven Gear
6 – 1st-2nd Gear Synchronizer Assembly	14 – Rear Snap Ring
7 – Front Snap Ring	15 – Rear Bearing Of Output Shaft
8 – 1st-2nd Needle Roller Bearing	

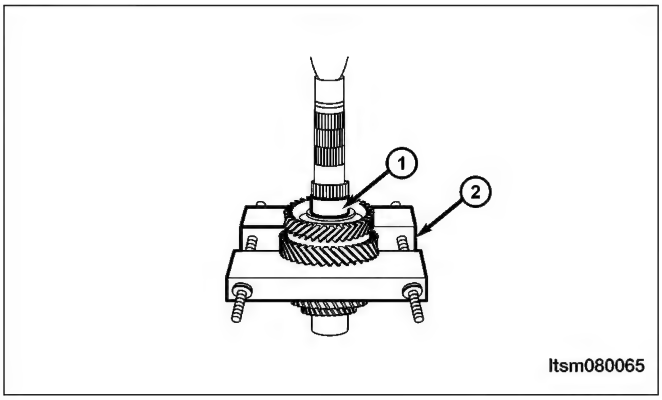
1. Using special tool MB-998801 (1), remove the front and rear bearing of output shaft with press.



2. Use snap-ring pliers to remove the rear snap ring.
3. Using special tool MB-998801 (2), remove the 4th and 5th driven gear (1) with press.

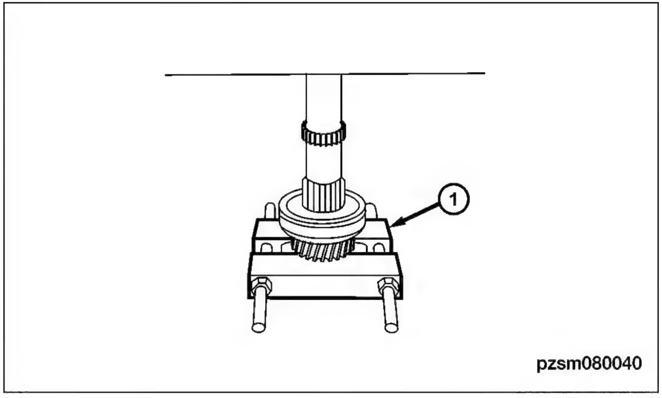


4. Using special tool MB-998801 (2), remove the gear sleeve (1) with press.



5. Remove the 3rd driven gear.
6. Remove the 2nd driven gear.

7. Remove the 1st-2nd gear synchronizer ring assembly.
8. Remove the 1st-2nd needle roller bearing.
9. Use snap-ring pliers to remove the front snap ring.
10. Using special tool MB-998801 (1), remove the 1st-2nd gear synchronizer assembly.
11. Remove the 1st driven gear.



Inspection

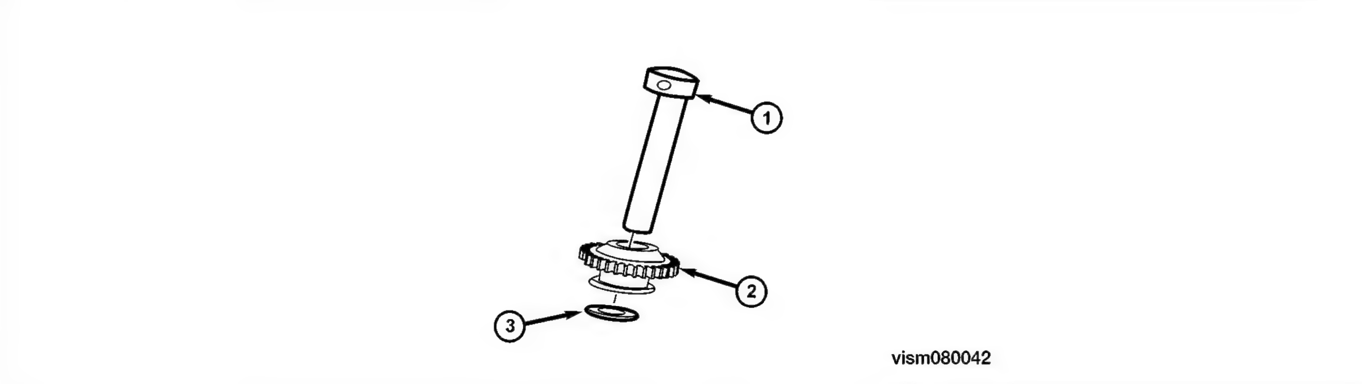
1. Clean all components.
2. Inspect the following components for wear:
    - Output shaft
    - Needle roller bearing
    - 1st driven gear
    - 2nd driven gear
    - 1st-2nd synchronizer gear sleeve
    - Synchronizer ring
    - Damage on the tooth surfaces and conical surfaces

Assembly

1. Assemble in the reverse order of disassembly.

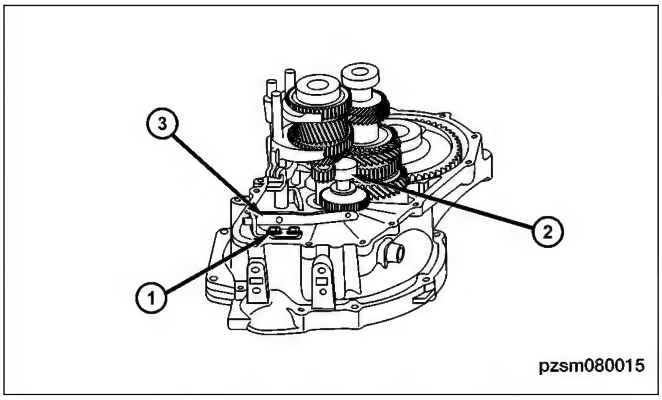
Idler Gear

Disassembly

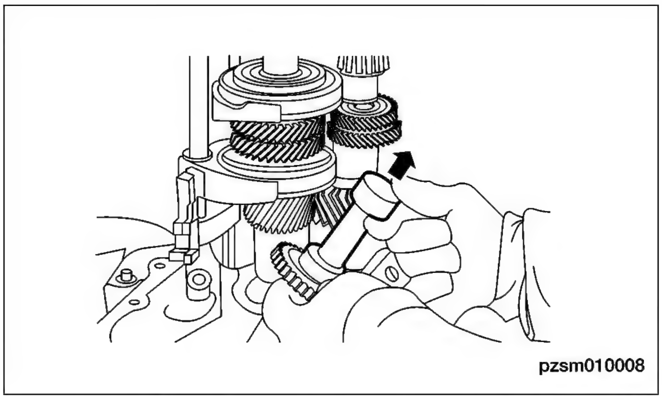


1 – Idler Gear Shaft	3 – Idler Gear Gasket
2 – Reverse Idler Gear	

1. Remove the reverse shift arm bracket retaining bolts (1) and the reverse shift arm (2) then take off the idle gear shaft (3).



2. Separate the reverse idle gear from idle gear shaft and take off the idle gear gasket.



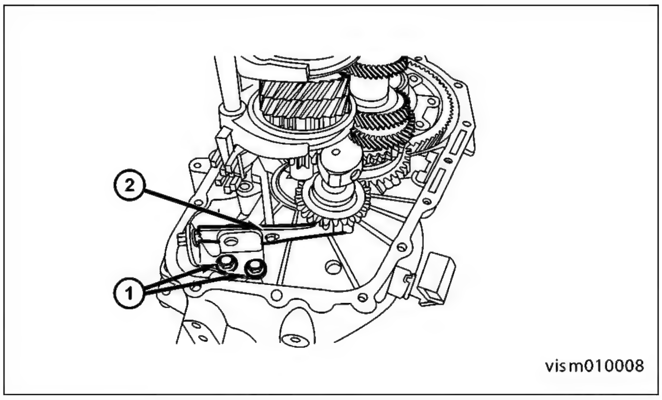
Assembly

1. Assemble in the reverse order of disassembly.

Reverse Shift Fork

Disassembly

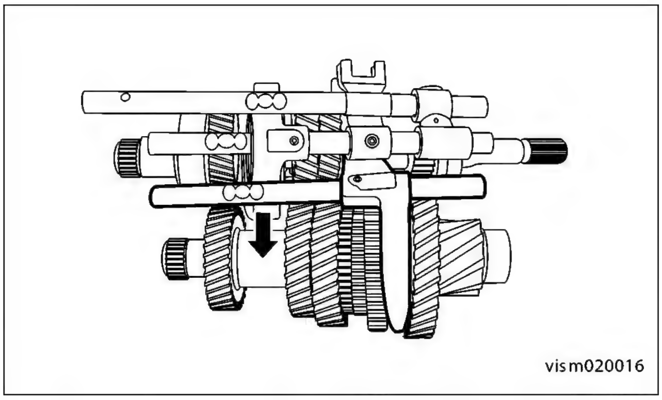
1. Remove the reverse shift arm bracket retaining bolts (1) and the reverse shift arm assembly (2) .



1st-2nd Shift Fork

Disassembly

1. Separate the 1st-2nd shift fork from the shift fork assembly.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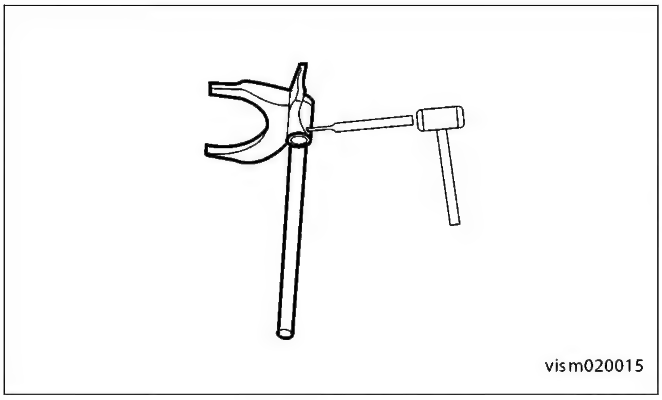
2. Use a suitable tool to remove the shift fork spring pin from the shift fork and the shift fork shaft.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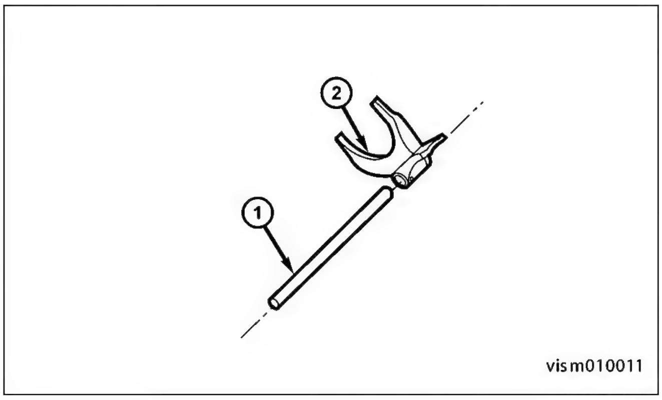
3. Remove the shift fork shaft (1) from the shift fork (2).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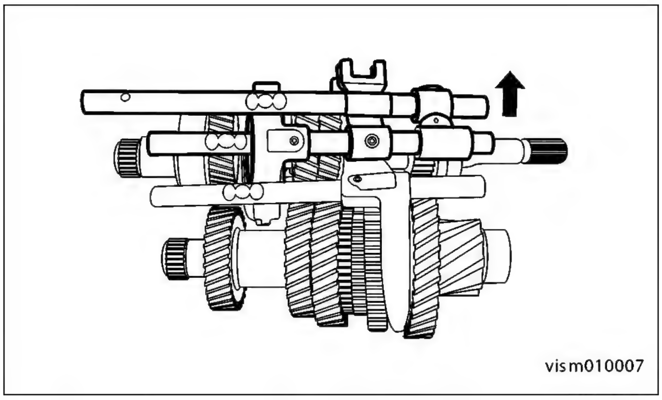
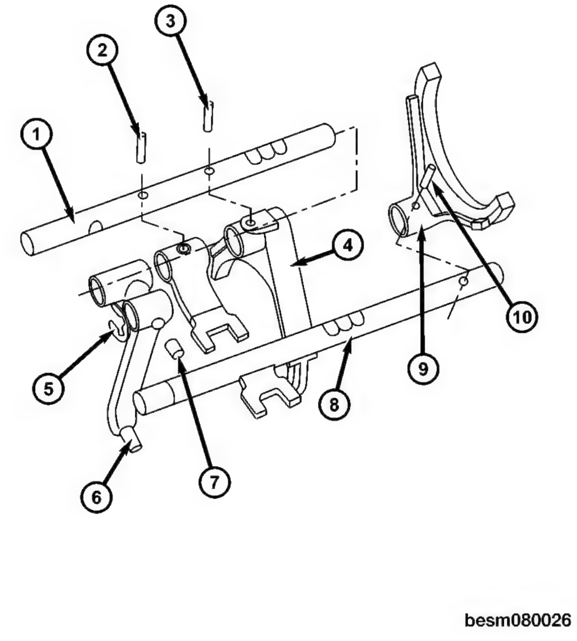
3rd, 4th, 5th & Reverse Fork Shaft

Disassembly

1. Separate the 3rd, 4th, 5th & reverse shift fork from the shift fork assembly.





1 – 3rd-4th Shift Fork Shaft	6 – Reverse Shaft
2 – Spring Pin	7 – Interlock Pin
3 – Spring Pin	8 – 5th-Reverse Shift Fork Shaft
4 – 3rd-4th Shift Fork	9 – 5th-Reverse Shift Fork
5 – Split Baffle Ring	10 – Spring Pin for Fork Shaft

2. Remove the spring pins (2) & (3) from the 3rd-4th shift fork shaft (1).
3. Remove the split baffle ring (5).
4. Separate the 3rd-4th shift fork shaft (1) and 3rd-4th shift fork (4).
5. Separate the reverse shaft (6).
6. Remove the interlock pin (7) and spring pin (10)
7. Separate the 5th-reverse shift fork shaft (8) from 5th-reverse shift fork (9).

DIFFERENTIAL

GENERAL INFORMATION 08-37
- Description 08-37
- Operation 08-38
- Specifications 08-38
- Special Tools 08-38

DIFFERENTIAL UNIT REPAIR 08-39

Differential Carrier 08-39
- Removal & Installation 08-39
- Disassembly 08-39
- Inspection 08-40
- Assembly 08-40

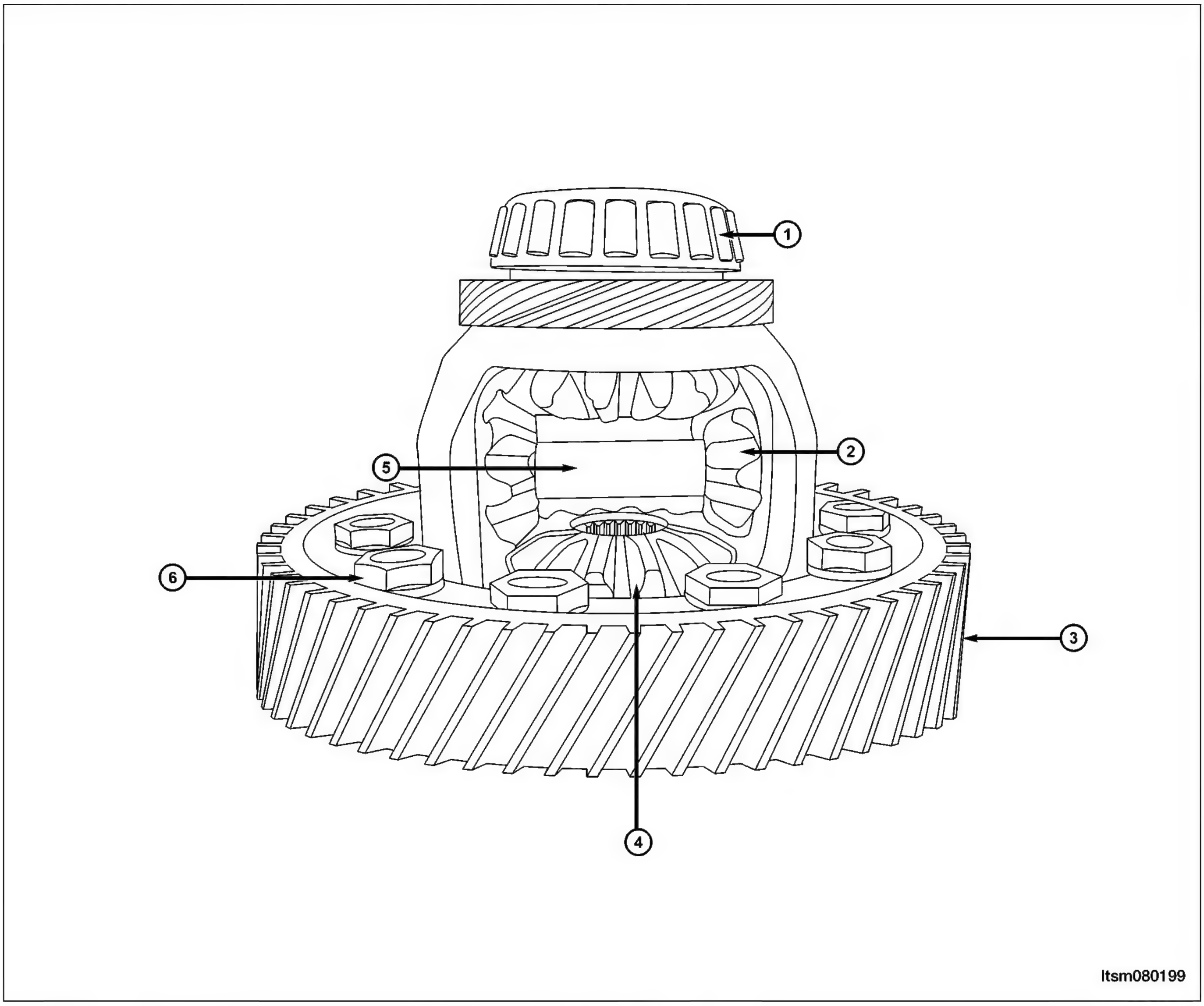
GENERAL INFORMATION

Description

The differential includes the differential side gears and the shaft mounted differential pinion gears. Direct contact between the gears and the differential case is prevented by the differential side gear thrust washers installed under the gears. The differential pinion shaft is held in position by a differential pinion shaft lock pin that extends through the end of the differential pinion shaft and the differential case.

The differential assembly consists of the following components:

- Differential case (part of the final drive carrier)
- 2 pinion gears supported by a pinion shaft
- 2 side gears supported by the differential case and halfshafts



1 – Differential Bearing	4 – Side Gear
2 – Planetary Gear	5 – Planetary Gear Shaft
3 – Final Drive Driven Gear	6 – Bolts - Final Drive Driven Gear and Differential Housing

Operation

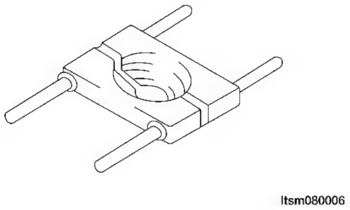
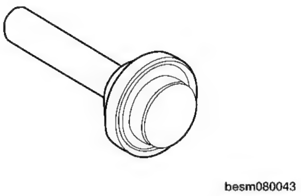
The differential operates through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are connected to the axle shafts.

Specifications

Clearance Specifications

DESCRIPTION	CLEARANCE (mm)
Clearance between side gear and planetary gear	0.025 - 0.150
Adjusting washer	0.93 - 1.00

Special Tools

Bearing Remover MD-998801	
Differential Seal Installer CH-30002	

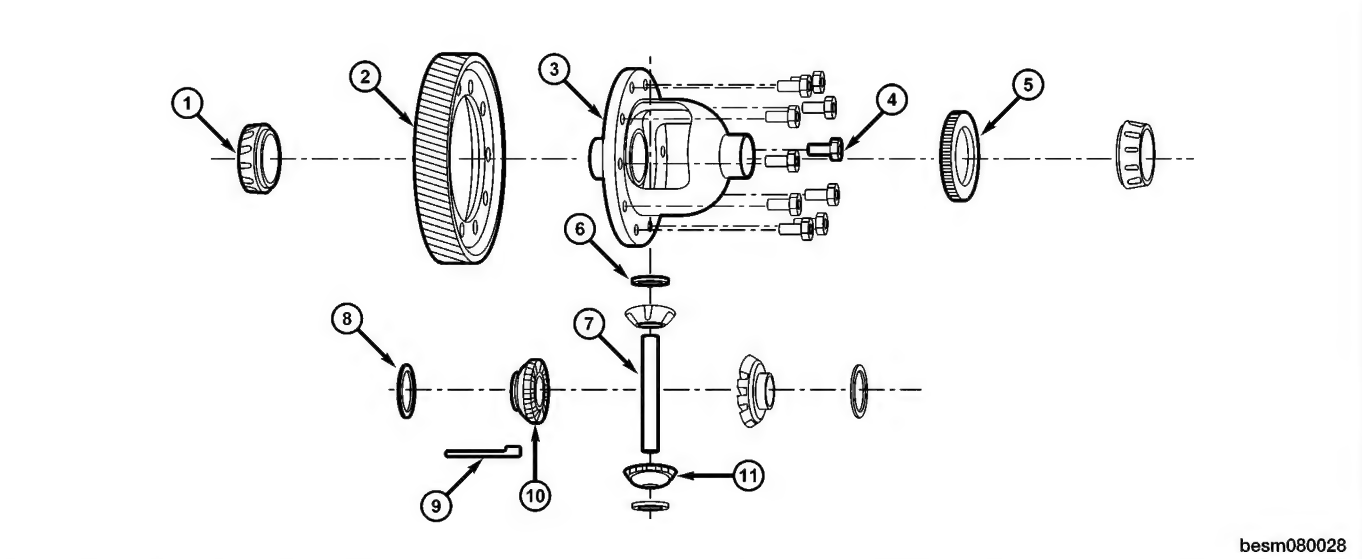
DIFFERENTIAL UNIT REPAIR

Differential Carrier

Removal & Installation

1. Remove the input shaft assembly, output shaft assembly, 1st-2nd shift fork, 3rd-4th shift fork and 5th-reverse fork shaft together as a unit. (See Transaxle Assembly Unit Repair in Section 08 Transaxle).
2. Remove the differential assembly.

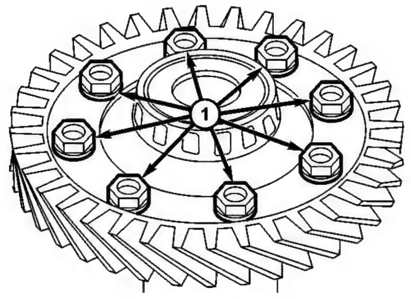
Disassembly



besm080028

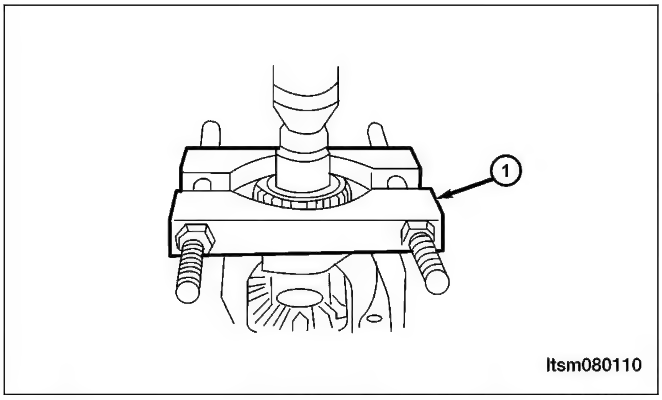
1 – Front/Rear Differential Bearing	7 – Planetary Gear Shaft
2 – Final Drive Driven Gear	8 – Adjusting Washer - Side Gear
3 – Differential Housing	9 – Fixing Pin - Planetary Gear
4 – Bolts - Final Drive Driven Gear and Differential Housing	10 – Side Gear
5 – Driving Gear - Odometer	11 – Planetary Gear
6 – Spherical Washer Planetary Gear	

1. Mount the differential in a vice.
2. Remove the eight drive gear bolts (1).

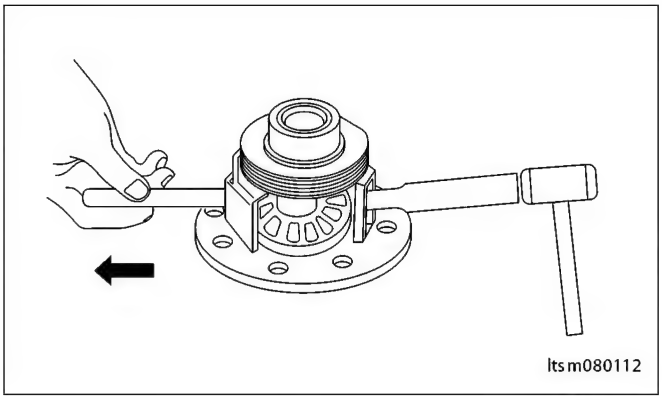


ltsm080117

3. Using special tool MD-998801 (1), disassemble the differential-front/rear shaft bearing.



4. Tap the drive gear off the differential case assembly using a suitable tool.
5. Remove the pinion mate shaft.
6. Turn the pinion mate gear, then remove the pinion mate gear, pinion mate thrust washer, side gear and side gear thrust washer from the differential case.



Inspection

1. Clean all components.
2. Inspect the following components for wear:
    - Ring gear
    - Adjusting washers
    - Side gears
    - Spherical washers
    - Planetary gears
    - Planetary gear shaft

Assembly

Installation of the adjusting washers, side gears, spherical washers, planetary gears and the planetary gear shaft:

Install the adjusting washers respectively on the backs of the side gears and put the side gears in place within the differential.

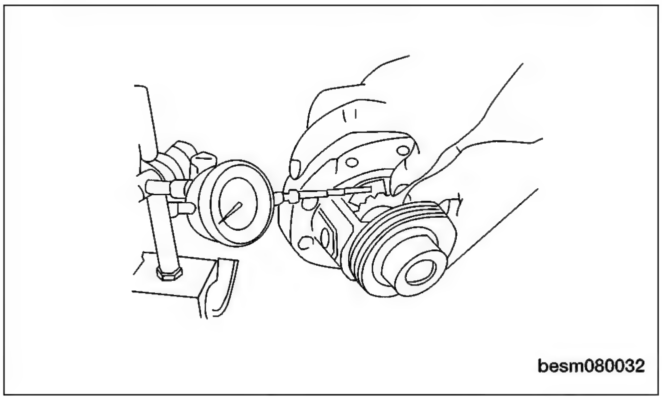
NOTE :

The adjusting washer for any new side gear should be the appropriate thickness (0.93-1.00 mm).

Engage two planetary gears with side gears behind the spherical washers on the backs of the planetary gears (rotate the gears for proper alignment).

- Insert the planetary gear shaft.
- Measure the clearance between the side gear and planetary gear.

NOTE :
Standard value: 0.025-0.150 mm



DIFFERENTIAL SIDE GEAR CLEARANCE	
Standard	0.025 - 0.150 mm
Adjusting Washer	0.93 - 1.00 mm

- If any measured clearance is not within specifications, select and install the appropriate adjusting washer(s) and then measure the clearances again.

NOTE :
Adjust the side clearance equally on both sides.

CLUTCH SYSTEM

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Operation 08-43
Specifications 08-43
Special Tools 08-44

CLUTCH ASSEMBLY SERVICE 08-45

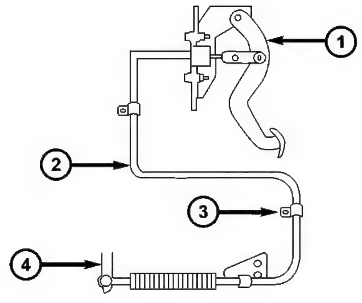
Clutch and Pressure Plate 08-45
Removal & Installation 08-45

Clutch Release Mechanism 08-47
Removal & Installation 08-47

Clutch Cable 08-47
Removal & Installation 08-47

GENERAL INFORMATION

Description



The clutch is a diaphragm-spring clutch of a dry single disc type. It consists of a clutch pedal (1), clutch cable (2), clutch cable bracket (3), and release shaft (4). It is controlled by the clutch cable directly.

Operation

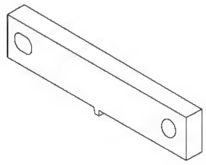
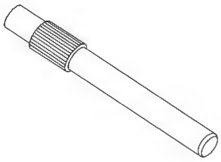
The clutch system is responsible for engaging and disengaging the clutch. Depressing the clutch pedal causes the release to advance and push on the tips of the tapering fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, there by interrupting the flow of drive from flywheel through clutch disc to transaxle input shaft.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Slave Cylinder Bolts	20 ± 2
Clutch Pressure Plate Bolts	30 ± 5
Flywheel Bolts	80 ± 5

Special Tools

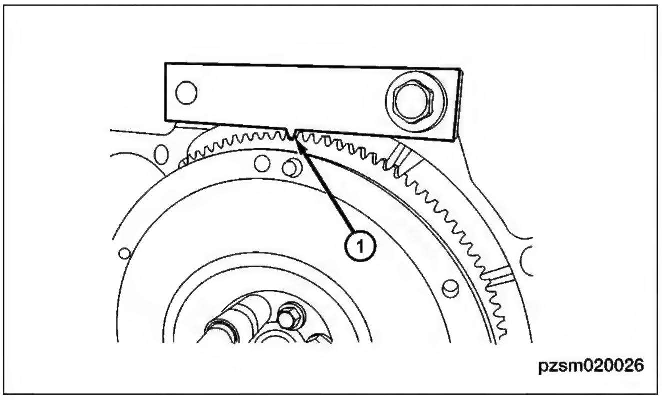
Flywheel Fixture CH-2009	 besm080040
Clutch Pressure Plate Installer CH-20014	 besm080041

CLUTCH ASSEMBLY SERVICE

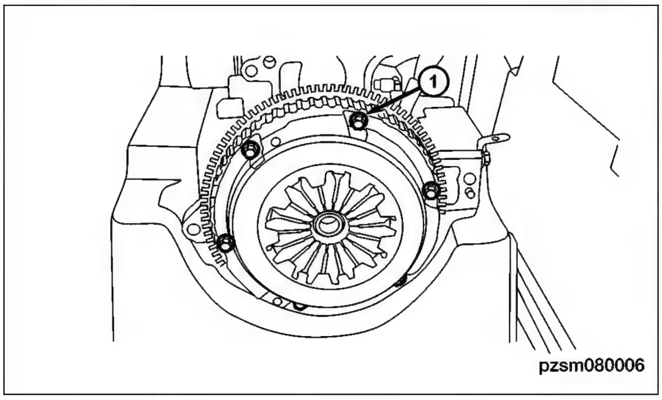
Clutch and Pressure Plate

Removal & Installation

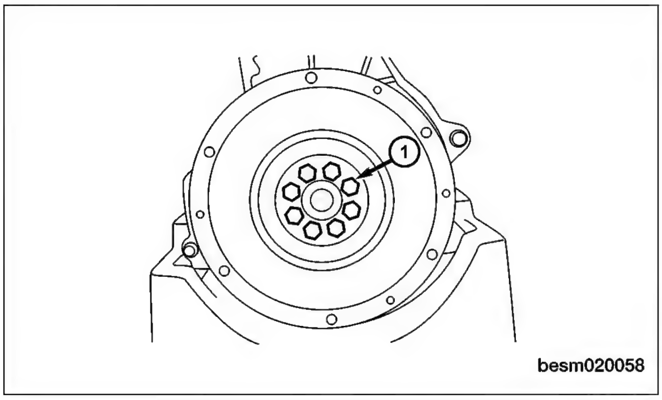
1. Remove the transaxle assembly (See Transaxle Assembly Removal & Installation in Section 08 Transaxle).
2. Using special tool CH-20043 (1), hold the flywheel.



3. Remove the clutch pressure plate bolts (1).
(Tighten: Clutch pressure plate bolts to 30 ± 5 N·m)
4. Remove the modular clutch assembly.



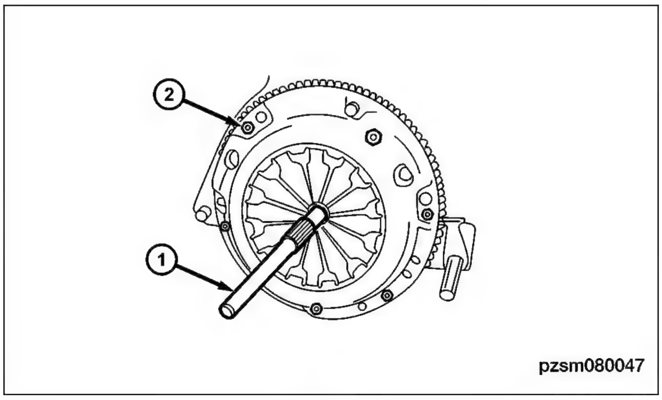
5. Remove the flywheel-to-crankshaft bolts (1) and remove the flywheel (if necessary for resurfacing).
(Tighten: Flywheel-to-crankshaft bolts to 80 ± 5 N·m)



6. Installation is in the reverse order of removal.

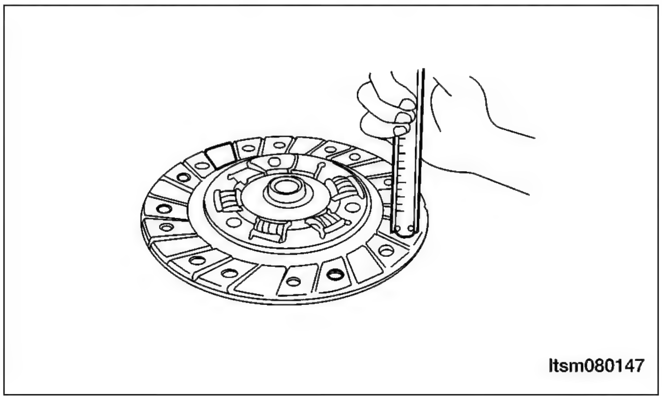
Installation Notes:

- Using the special tool CH-20014 (1) tighten the six clutch pressure plate retaining bolts (2).



Inspect

- Check the input shaft bearing to ensure it is able to rotate freely, replace the bearing if necessary.
- Measure the depth of the recesses of the clutch friction lining rivet head, i.e., the distance between rivet head and friction lining surface (as shown in the figure).
  If the depth of any hole comes to the limit, replace friction lining assembly .
  (Standard: 1.2 mm)
  (Limit: 0.5 mm)

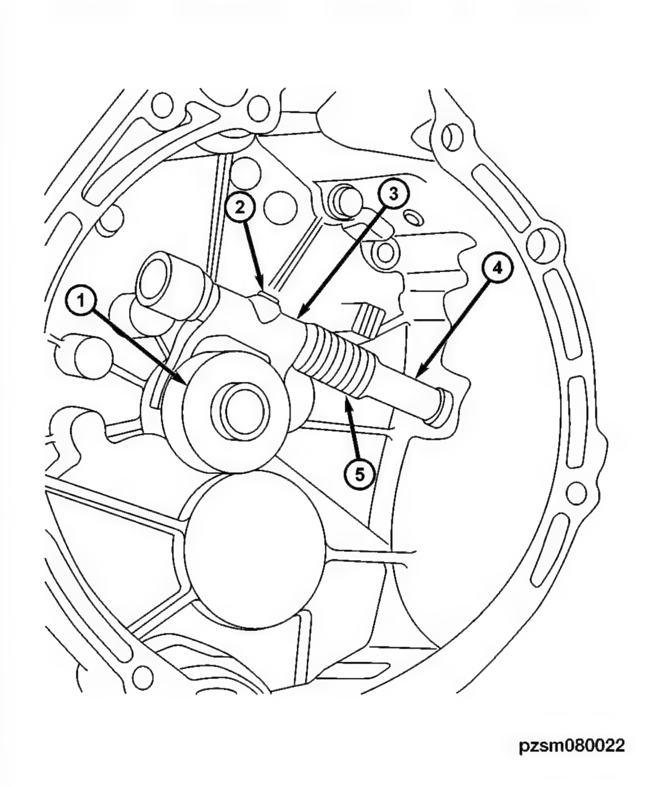


- Check clutch pressure plate diaphragm spring for irregular wear or damage.
- Check clutch pressure plate for wear or hot spots.
- If found abnormal, replace the clutch plate assembly. Never separate the clutch plate assembly into the diaphragm spring and clutch plate.
- Check the contact surface of the flywheel and friction lining for irregular wear or hot spots. Repair or replace if necessary.

Clutch Release Mechanism

Removal & Installation

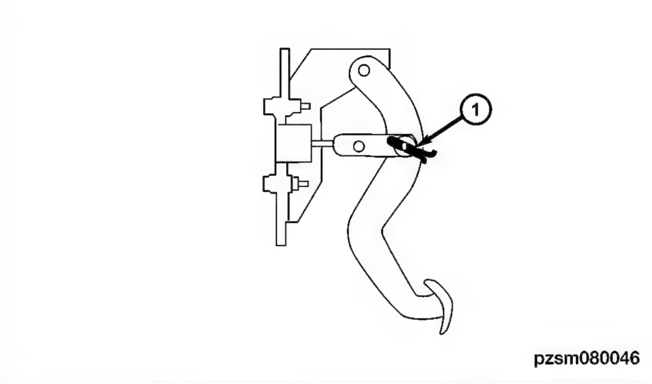
1. Remove the transaxle assembly (See Transaxle Assembly Removal & Installation in Section 08 Transaxle).
2. Remove the release arm bolt (2) and release the return torsion spring (5).
   (Tighten: Release arm bolt to 20 ± 2 N·m)
3. Remove the release shaft assembly (4) and remove the release fork (3).
4. Remove the release bearing (1).
5. Installation is in the reverse order of removal.



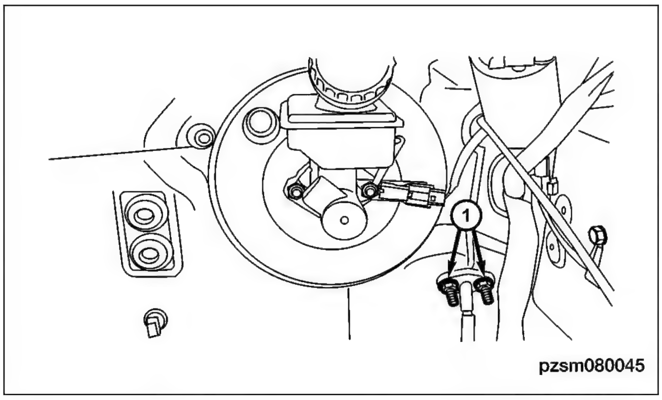
Clutch Cable

Removal & Installation

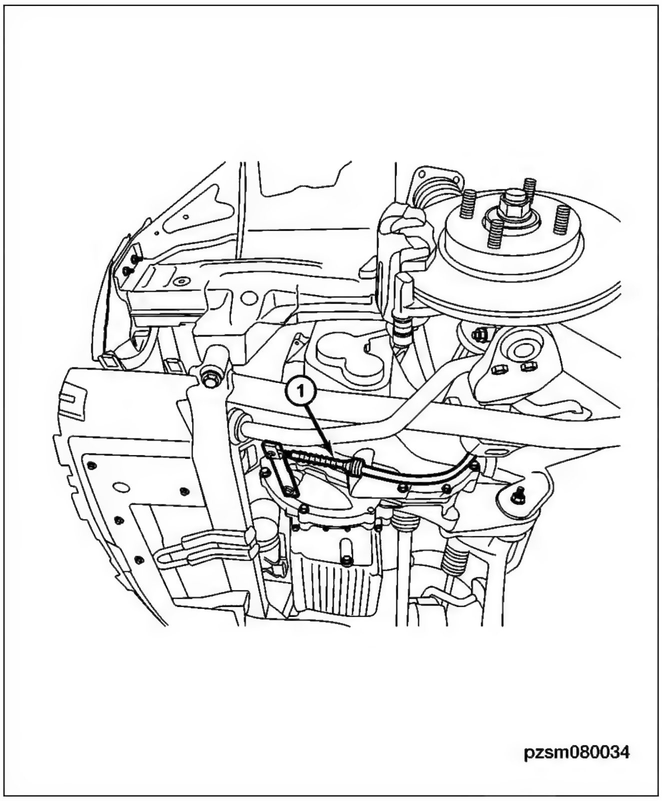
1. Remove the clutch cable to clutch pedal clamp (1).



2. Remove the clutch cable to the vehicle body retaining bolts (1).
   (Tighten: Clutch cable retaining bolt to 10 ± 2 N·m)



3. Remove the clutch cable (1) to the release shaft arm assembly.
4. Remove the clutch cable.
5. Installation is in the reverse order of removal.



AUTOMATED MANUAL TRANSAXLE (AMT) CONTROL SYSTEM

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- P0904 - Gear Position Sensor 08-79
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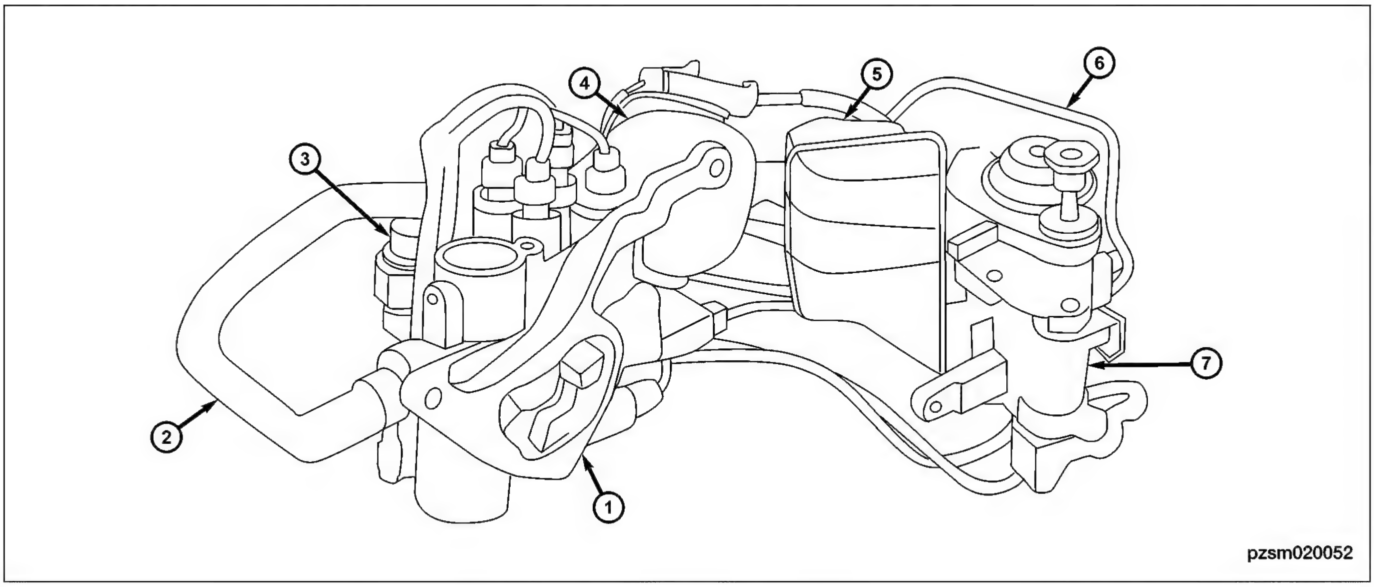
- Removal & Installation 08-105

Automated Manual Transaxle (AMT) Control Module 08-105
- Removal & Installation 08-105

GENERAL INFORMATION

Description

The Automated Manual Transaxle (AMT) control system is located on the transaxle housing. It consists of the following components:



1 - Gearshift Mechanism Cover	5 - Transaxle Fluid Reservoir
2 - Return Hose	6 - Pressure Pipe
3 - Electronic Control Valve Unit	7 - Clutch Cable Control Actuator
4 - Hydraulic Pressure Accumulator	

The AMT is based on the traditional manual transaxle. The AMT is equipped with an electro-mechanical, hydraulic control unit, thus incorporating an automatic five-speed transaxle.

Operation

The AMT electro-mechanical & hydraulic system is controlled by the AMT control module and Engine Control Module (ECM). The gear position is determined by the gearshift lever.

- Automatic Mode: The AMT control module performs gear changes according to a predetermined vehicle control strategy.
- Manual Mode: The driver controls the gear changes through the use of the gearshift lever.

AMT Hydraulic Fluid Inspection

Use and Selection of Proper AMT Hydraulic Fluid

When refilling the AMT system hydraulic fluid, only use approved hydraulic fluid specifically designed for the AMT system (Chery Part No. QR512E-4004011) available in one liter containers. No other fluids such as transmission fluid, brake fluid or power steering fluid can be used. If any other type of fluid is used, the AMT system could experience the following failures:

- Damaged seals
- Deposits formed in fluid
- Excessive air bubbles in fluid
- Unable to mix with residual fluid
- Insufficient hydraulic pressure

Refilling AMT Hydraulic Fluid

Perform the following procedure when refilling the AMT hydraulic reservoir with the approved fluid.

WARNING!

Do not refill the AMT hydraulic fluid until the internal system pressure has been relieved to 0 bar.

6. Connect the X-431 scan tool to the diagnostic connector.
7. Release the internal system pressure to 0 bar.
8. Check the fluid level in the fluid tank.
9. Fill the AMT hydraulic reservoir to the specified level shown inside the tank.

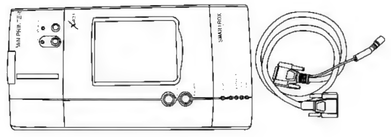
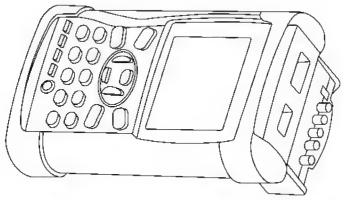
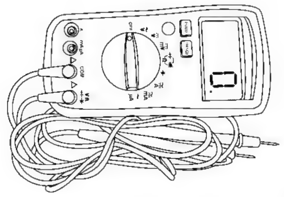
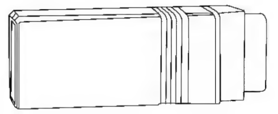
NOTE :
32 - 38 mm higher than the lowest fluid level marks for 372QQAMT

Specifications

Torque Specifications

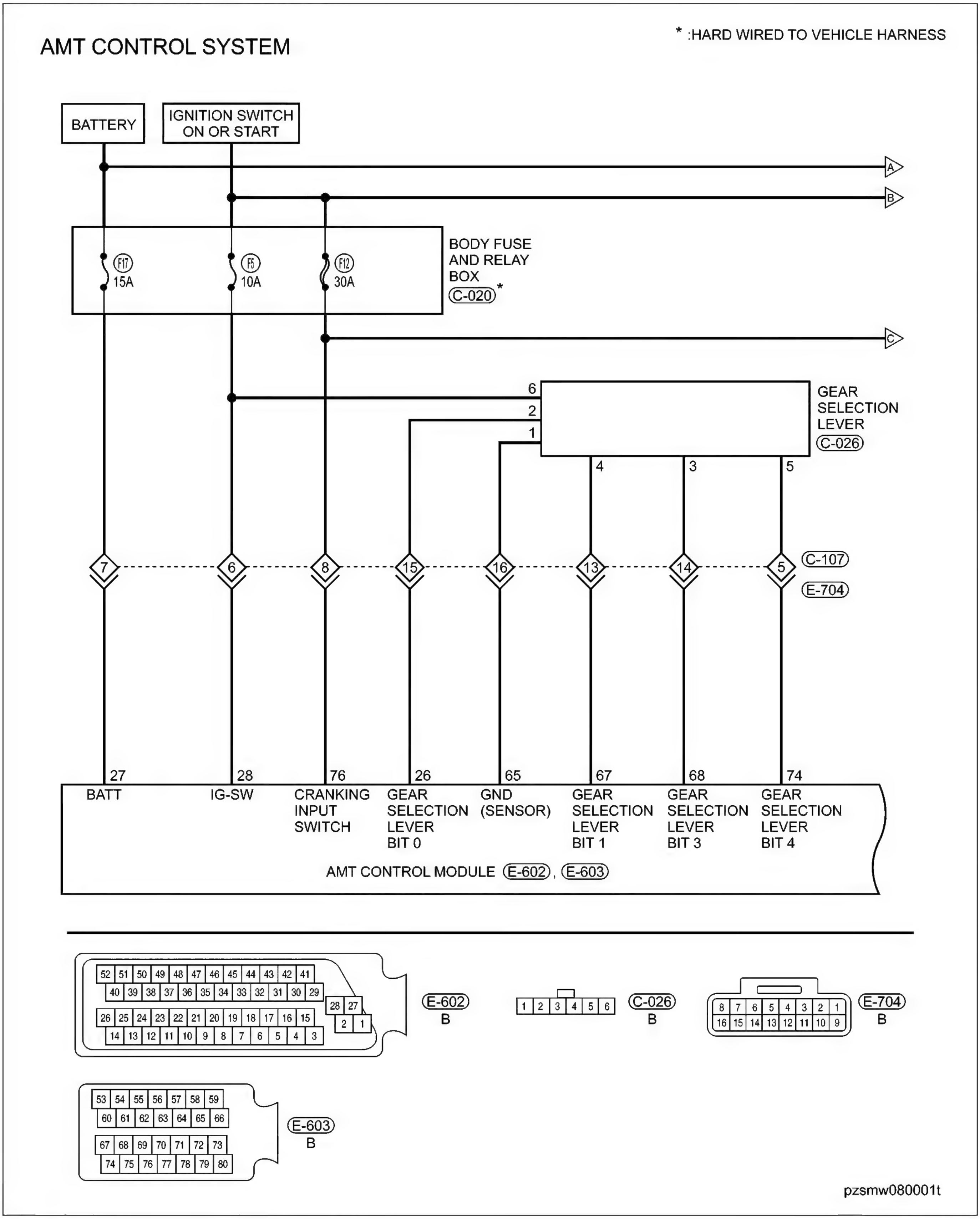
DESCRIPTION	TORQUE (N·m)
Control Shaft Cover Bolt	44 ± 2
Clutch Control Actuator Bolt	24 ± 2
AMT Control Module Bolt	10 ± 2
Gearshift Mechanism Bolt	10 ± 2

Special Tools

Diagnostic Scan Tool X-431	 besm030001
Engine Analyzer KES-200	 ltsmd030069
Digital Multimeter Fluke 15B & 17B	 besm030002
CAN-BUS ‖ Diagnostic Connector	 besm120036

Electrical Schematic

AMT Control System (Page 1 of 6)


AMT CONTROL SYSTEM
* :HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
A
B
C
F17 15A
F5 10A
F12 30A
BODY FUSE AND RELAY BOX
C-020 *
6
2
1
GEAR SELECTION LEVER
C-026
4
3
5
7
6
8
15
16
13
14
5
C-107
E-704
27 BATT
28 IG-SW
76 CRANKING INPUT SWITCH
26 GEAR SELECTION LEVER BIT 0
65 GND (SENSOR)
67 GEAR SELECTION LEVER BIT 1
68 GEAR SELECTION LEVER BIT 3
74 GEAR SELECTION LEVER BIT 4
AMT CONTROL MODULE E-602, E-603
52 51 50 49 48 47 46 45 44 43 42 41
40 39 38 37 36 35 34 33 32 31 30 29
28 27
2 1
26 25 24 23 22 21 20 19 18 17 16 15
14 13 12 11 10 9 8 7 6 5 4 3
E-602 B
1 2 3 4 5 6
C-026 B
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
E-704 B
53 54 55 56 57 58 59
60 61 62 63 64 65 66
67 68 69 70 71 72 73
74 75 76 77 78 79 80
E-603 B
pzsmw080001t

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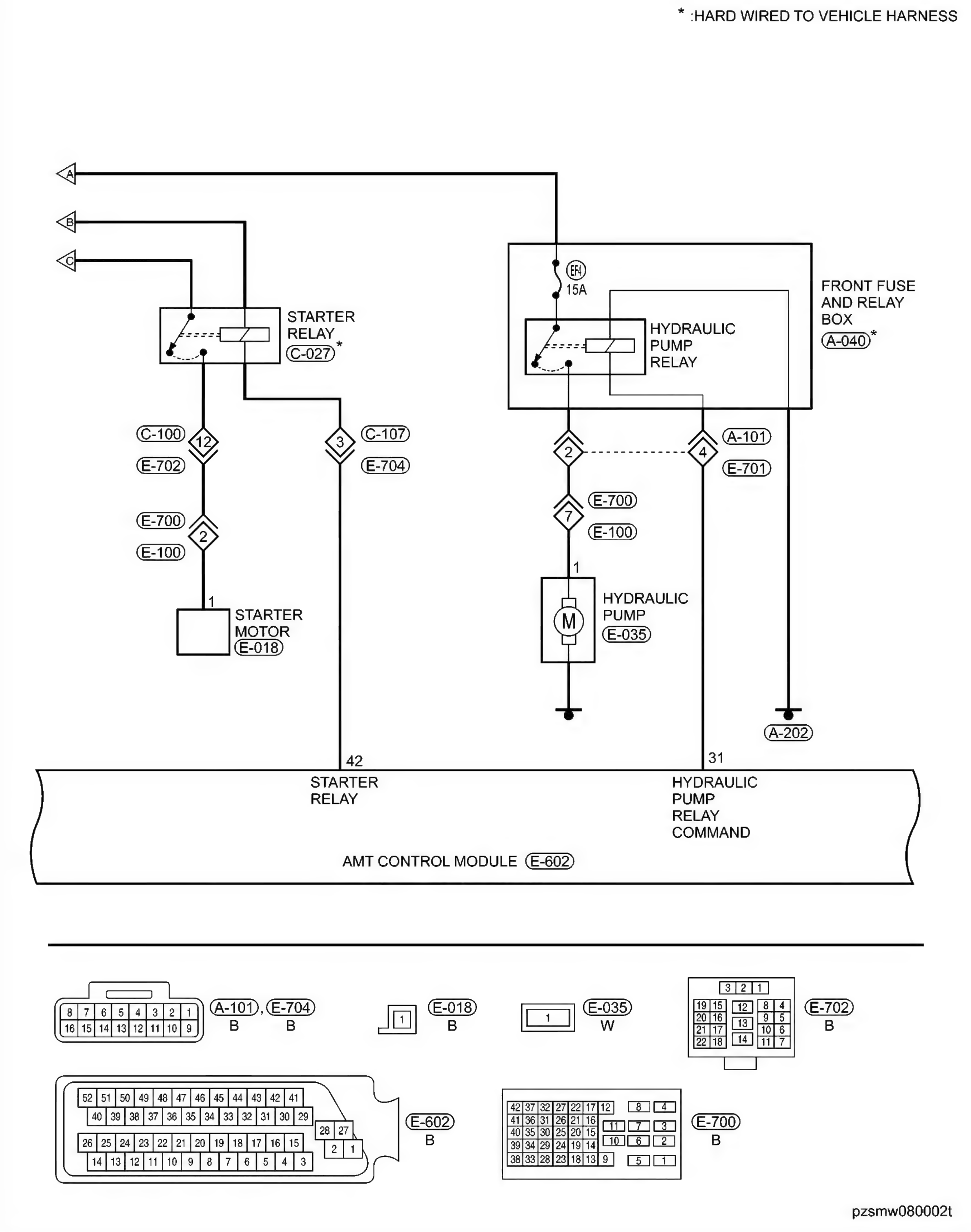
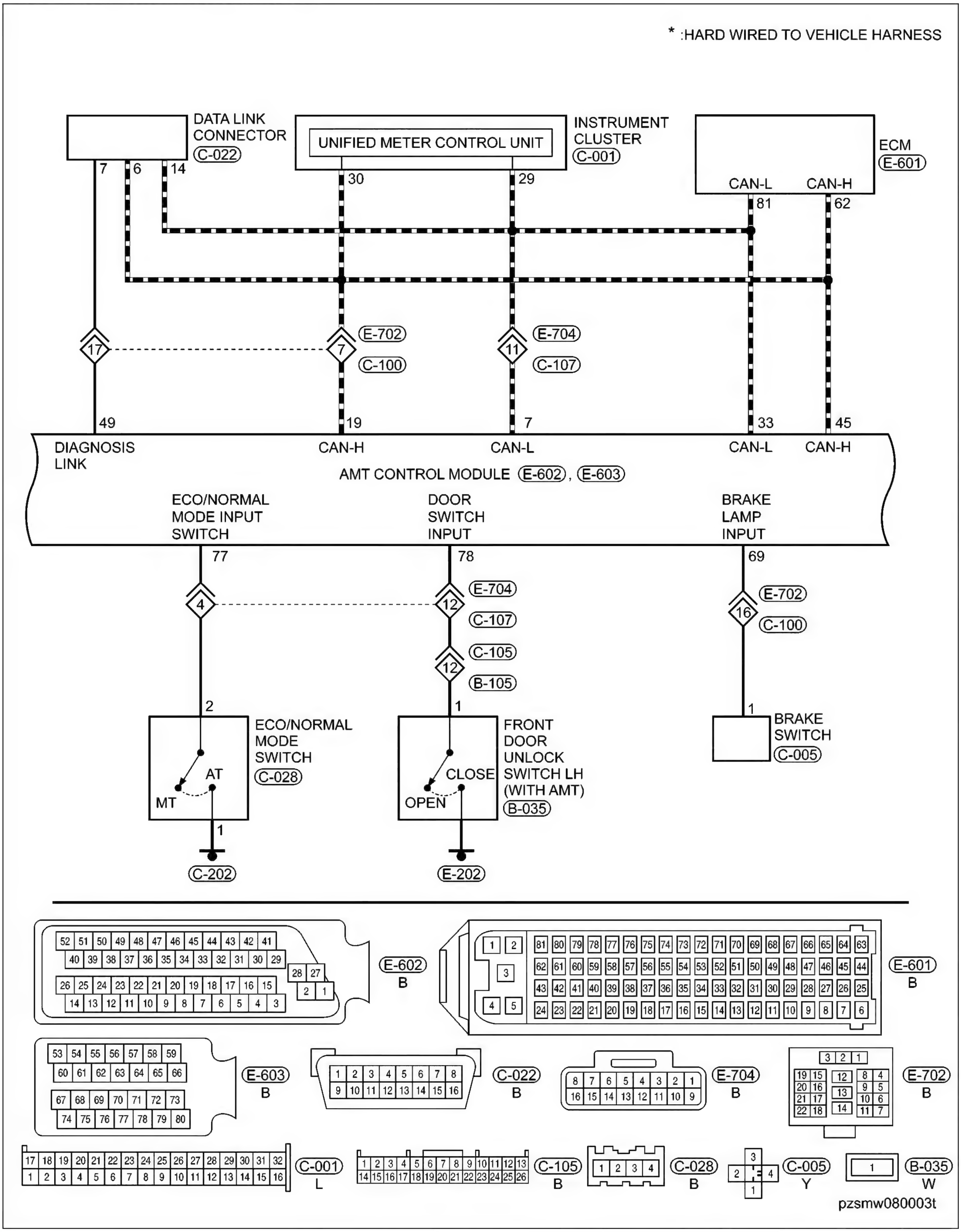
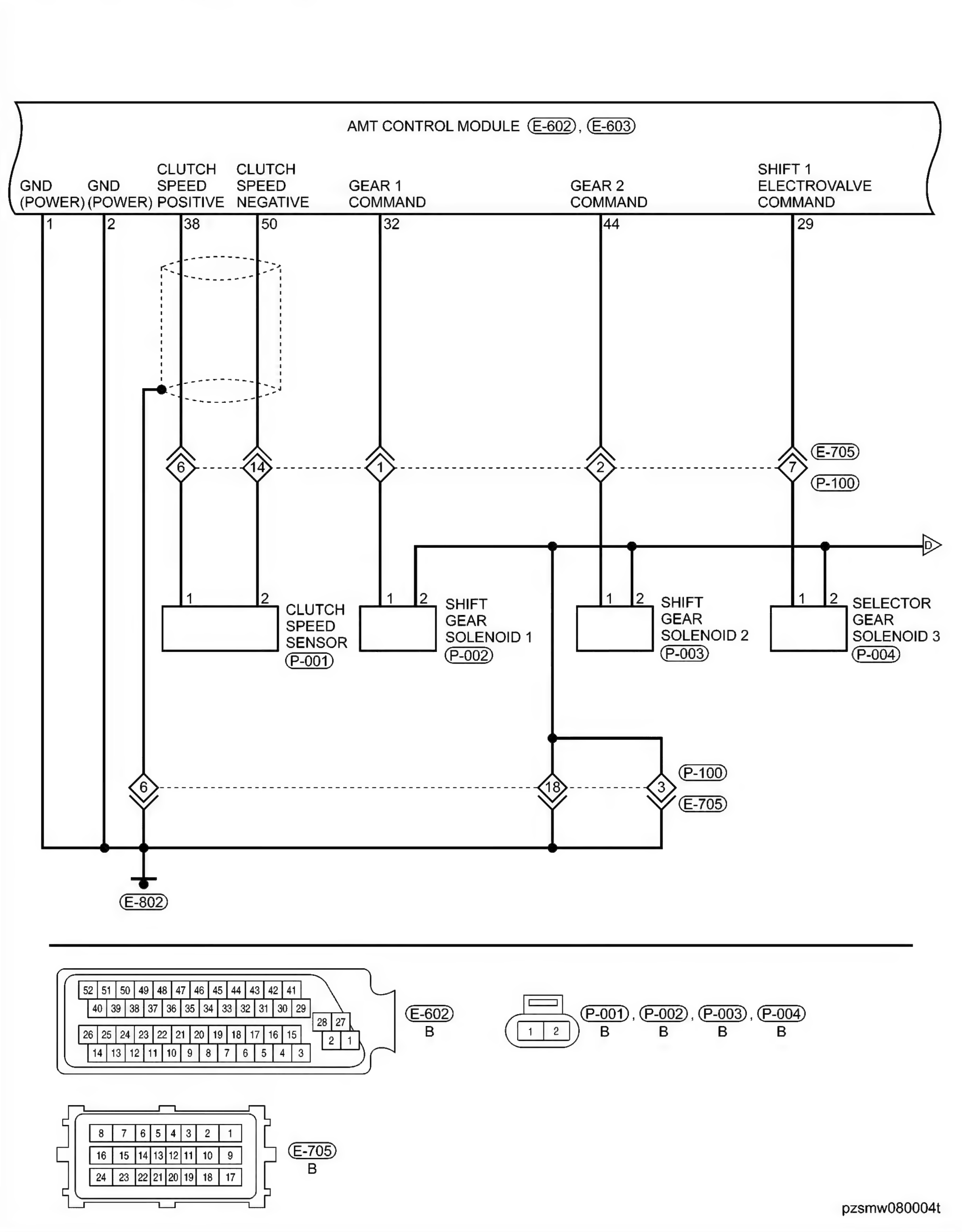

* :HARD WIRED TO VEHICLE HARNESS
A
B
C
STARTER RELAY
C-027 *
EF4
15A
HYDRAULIC PUMP RELAY
FRONT FUSE AND RELAY BOX
A-040 *
C-100
12
E-702
3
C-107
E-704
2
A-101
4
E-701
E-700
2
E-100
E-700
7
E-100
1
STARTER MOTOR
E-018
1
HYDRAULIC PUMP
E-035
M
A-202
42
STARTER RELAY
31
HYDRAULIC PUMP RELAY COMMAND
AMT CONTROL MODULE E-602
A-101, E-704
B B
E-018
B
E-035
W
E-702
B
E-602
B
E-700
B
pzsmw080002t

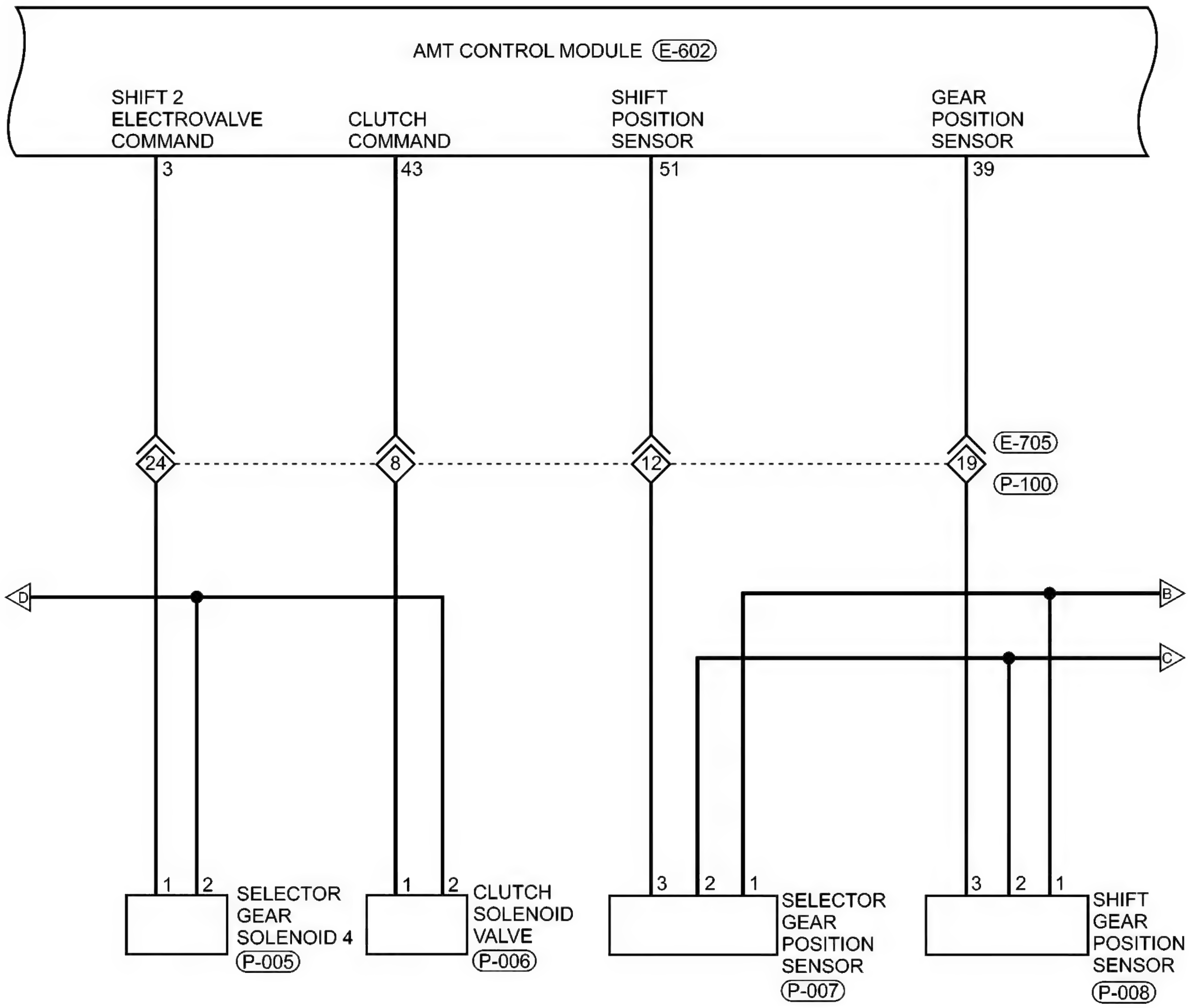
AMT Control System (Page 3 of 6)

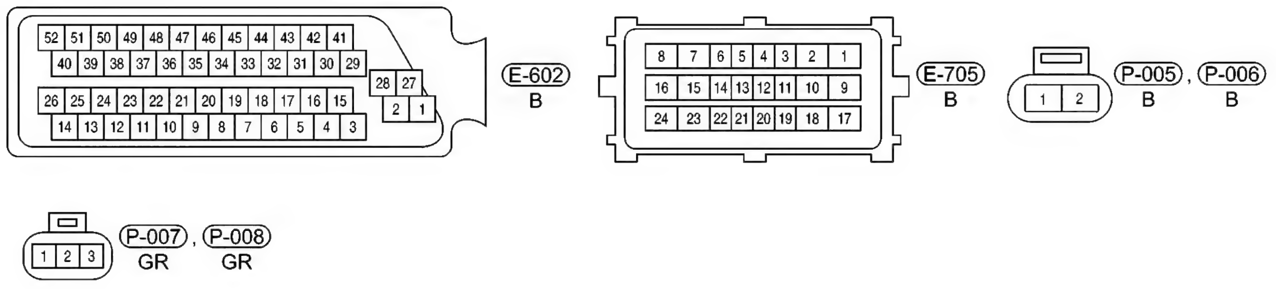

* :HARD WIRED TO VEHICLE HARNESS
DATA LINK CONNECTOR
C-022
7
6
14
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
30
29
ECM
E-601
CAN-L
CAN-H
81
62
17
7
E-702
C-100
11
E-704
C-107
49
19
7
33
45
DIAGNOSIS LINK
CAN-H
CAN-L
CAN-L
CAN-H
AMT CONTROL MODULE E-602, E-603
ECO/NORMAL MODE INPUT SWITCH
DOOR SWITCH INPUT
BRAKE LAMP INPUT
77
78
69
4
12
E-704
C-107
12
C-105
B-105
16
E-702
C-100
2
1
1
ECO/NORMAL MODE SWITCH
C-028
AT
MT
1
C-202
FRONT DOOR UNLOCK SWITCH LH (WITH AMT)
B-035
CLOSE
OPEN
E-202
BRAKE SWITCH
C-005
E-602
B
E-601
B
E-603
B
C-022
B
E-704
B
E-702
B
C-001
L
C-105
B
C-028
B
C-005
Y
B-035
W
pzsmw080003t

AMT Control System (Page 4 of 6)


AMT CONTROL MODULE E-602, E-603
GND (POWER)
GND (POWER)
CLUTCH SPEED POSITIVE
CLUTCH SPEED NEGATIVE
GEAR 1 COMMAND
GEAR 2 COMMAND
SHIFT 1 ELECTROVALVE COMMAND
1
2
38
50
32
44
29
6
14
1
2
7
E-705
P-100
D
CLUTCH SPEED SENSOR P-001
SHIFT GEAR SOLENOID 1 P-002
SHIFT GEAR SOLENOID 2 P-003
SELECTOR GEAR SOLENOID 3 P-004
6
18
3
P-100
E-705
E-802
E-602 B
P-001, P-002, P-003, P-004 B B B B
E-705 B
pzsmw080004t

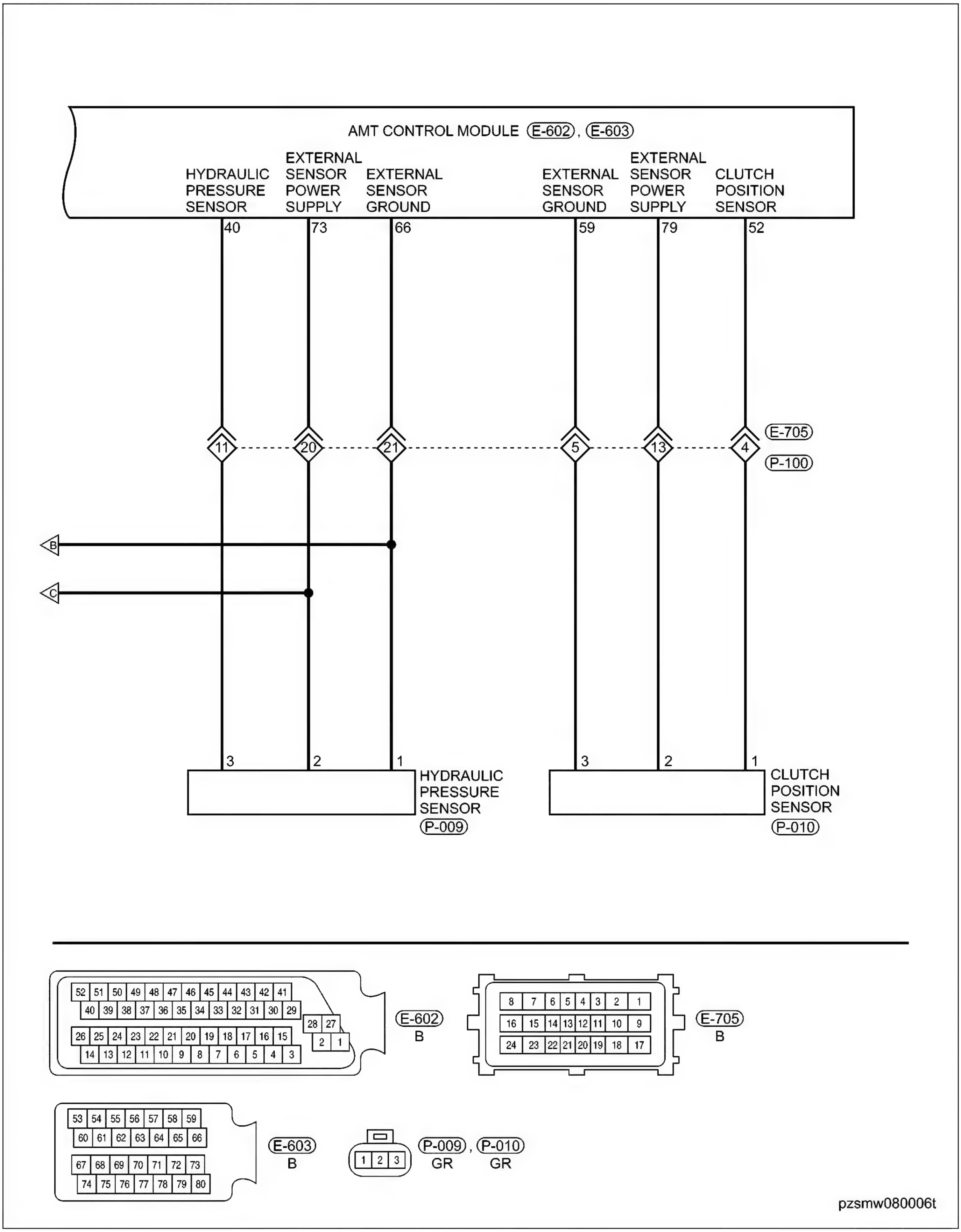
AMT Control System (Page 5 of 6)


AMT CONTROL MODULE E-602
SHIFT 2 ELECTROVALVE COMMAND
CLUTCH COMMAND
SHIFT POSITION SENSOR
GEAR POSITION SENSOR
3
43
51
39
24
8
12
19
E-705
P-100
D
B
C
1
2
SELECTOR GEAR SOLENOID 4
P-005
1
2
CLUTCH SOLENOID VALVE
P-006
3
2
1
SELECTOR GEAR POSITION SENSOR
P-007
3
2
1
SHIFT GEAR POSITION SENSOR
P-008


52 51 50 49 48 47 46 45 44 43 42 41
40 39 38 37 36 35 34 33 32 31 30 29
28 27
2 1
26 25 24 23 22 21 20 19 18 17 16 15
14 13 12 11 10 9 8 7 6 5 4 3
E-602
B
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
24 23 22 21 20 19 18 17
E-705
B
1 2
P-005, P-006
B B
1 2 3
P-007, P-008
GR GR

pzsmw080005t

AMT Control System (Page 6 of 6)


AMT CONTROL MODULE (E-602), (E-603)
HYDRAULIC PRESSURE SENSOR
EXTERNAL SENSOR POWER SUPPLY
EXTERNAL SENSOR GROUND
EXTERNAL SENSOR GROUND
EXTERNAL SENSOR POWER SUPPLY
CLUTCH POSITION SENSOR
40
73
66
59
79
52
11
20
21
5
13
4
(E-705)
(P-100)
B
C
3
2
1
HYDRAULIC PRESSURE SENSOR
(P-009)
3
2
1
CLUTCH POSITION SENSOR
(P-010)
(E-602)
B
(E-705)
B
(E-603)
B
(P-009), (P-010)
GR GR
pzsmw080006t

Automated Manual Transaxle (AMT) Control Module Connector Pin-Out Table

AMT Control Module Pin-Out Table

PIN	CIRCUIT INDENTIFICATION	PIN	CIRCUIT INDENTIFICATION
1	Power Ground	41	-
2	Power Ground	42	-
3	Gear 4 Command	43	Clutch Command
4	-	44	Gear 2 Command
5	-	45	CAN-H
6	-	46	-
7	CAN-L	47	-
8	-	48	-
9	-	49	Diagnostic Line
10	-	50	Clutch Speed Negative
11	-	51	Shift Position Sensor
12	-	52	Clutch Position Sensor
13	-	53	-
14	-	54	-
15	-	55	-
16	-	56	-
17	-	57	-
18	-	58	-
19	CAN-H	59	External Sensor Ground
20	-	60	-
21	-	61	-
22	-	62	-
23	-	63	-
24	-	64	-
25	-	65	External Sensor Ground
26	Gear Selection Lever Bit 0	66	External Sensor Ground
27	Battery	67	Gear Selection Lever Bit 1
28	Ignition Switch	68	Gear Selection Lever Bit 3
29	Gear 3 Command	69	Brake Lamp Input
30	-	70	-
31	Hydraulic Pump Relay Command	71	-
32	Gear 1 Command	72	-
33	CAN-L	73	External Sensor Power Supply
34	-	74	Gear Selection Lever Bit 2
35	-	75	-
36	-	76	Cranking Input Switch
37	-	77	ECO/Normal Mode Input Switch
38	Clutch Speed Positive	78	Door Switch Input
39	Gear Position Sensor	79	External Sensor Power Supply
40	Hydraulic Pressure Sensor	80	-

DIAGNOSIS & TESTING

Diagnostic Help

1. The X-431 scan tool connects to the Data Link Connector (DLC) and communicates with the vehicle electronic modules through the data network.
2. Confirm that the malfunction is current and carry-out the diagnostic tests and repair procedures.
3. If the Diagnostic Trouble Code (DTC) cannot be deleted, it is a current fault.
4. Use a digital multimeter to perform voltage readings on electronic systems.
5. Refer to any Technical Bulletins that may apply to the failure.
6. Visually inspect the related electrical wiring harness.
7. The scan tool connects to the Data Link Connector (DLC) and communicates with the Automated Manual Transaxle (AMT) control module over the CAN data circuit.
8. If numerous trouble codes were set, use an electrical schematic and look for any common ground circuits or voltage supply circuits that may apply to the DTC.

Intermittent DTC Troubleshooting

If the failure is intermittent perform the following:

- Check for loose connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Monitor the scan tool data relative to this circuit.
- Wiggle the related electrical wiring harness and connectors while looking for an interrupted signal on the affected circuit.
- If possible, try to duplicate the conditions under which the DTC set.
- Look for the data to change or for the DTC to reset during the wiggle test.
- Look for broken, bent, pushed out or corroded terminals.
- Inspect the sensor and mounting area for any condition that would result in an incorrect signal, such as damage, or foreign material.
- A data recorder, and/or oscilloscope should be used to help diagnose intermittent conditions.
- Remove the Engine Control Module (ECM) from the troubled vehicle and install in a new vehicle and test. If the DTC cannot be deleted, the ECM is malfunctioning. If the DTC can be deleted, return the ECM to the original vehicle.

Ground Inspection

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This added resistance can alter the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can effect the circuit. Perform the following when inspecting a ground connection:

1. Remove the ground bolt or screw.
2. Inspect all mating surface for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for ″add-on″ accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are crimped to one eyelet, make sure no excess wire insulation has been crimped creating a bad ground.

Diagnostic Tools

1. Diagnostic Scan Tool X-431
2. Digital Multimeter
3. Jumper Wire

Automated Manual Transaxle (AMT) Control Module Electrical Harness Test Tool

If using an Automated Manual Transaxle (AMT) control module electrical harness test tool, you can diagnose the AMT control module harness while the AMT control module is still connected.

- Measure sensor and solenoid resistance (always measure resistance with the power off).
- Measure the signal voltage of the AMT control module (always measure voltage with the power on).

NOTE :
Using the Automated Manual Transaxle (AMT) control module electrical harness test tool will help prevent electrical connector terminal damage.

Automated Manual Transaxle (AMT) Self-Learning Information and Operating Procedure

The AMT is an electronically controlled transaxle providing precise shifting. The transaxle electronics are self-calibrating, therefore, the first few shifts on a new vehicle may be somewhat abrupt. This is a normal condition, and precision shifts will develop within a few kilometers. The transaxle system uses an electronically operated hydraulic unit coupled to the existing mechanical transaxle that automatically controls the clutch and gearshift operations. The AMT uses the following components for operation:

- The AMT control module monitors the following inputs:
  - Vehicle speed sensor
  - AMT input sensor
- The AMT control module controls the following outputs:
  - Three proportion solenoids
  - Two conversion switches
  - Two pressure pumps
  - Engine starter relay

It is necessary to perform the AMT re-calibration and self-learning procedure when any of the following repairs have been made:

- AMT control module replacement
- AMT gearshift mechanism replacement
- AMT electro-mechanical control unit replacement
- Repair or replacement of any components of the AMT electro-mechanical control unit
- Clutch assembly replacement

NOTE :
The AMT re-calibration and self-learning procedure is required to calibrate the following parameters:

- Engagement and selection position to manage gearshifts
- PIS (Point of Initial clutch Slippage) calibration

AMT Warning Lamp Control Strategy

When a confirmed AMT system failure is present, the transaxle warning light turns on in the instrument cluster, and a warning buzzer will sound to alert the driver of the failure. The following conditions occur when the AMT control module has determined a failure is present:

- The failure is confirmed and stored in the AMT control module.
- The failure is stored in the EPROM automatically when the system is shut down, and it can be viewed with the scan tool.
- The failure is confirmed during operation.
- The system will resume when the failure is confirmed.

AMT Re-Calibration and Self-Learning Procedure

The AMT re-calibration and self-learning procedure is carried out in three separate steps. The three steps are as follows:

1. Stability Test
2. Self-Learning Test
3. Road Test

Step 1: Stability Test

1. Press the accelerator pedal fully.
2. Press the brake pedal.
3. Open the driver door.
4. Push the shift lever forward (+).
5. Pull the shift lever backward (-).
6. Move the shift lever to the A/M position.
7. Pull the shift lever in the R position.
8. Push the shift lever to the N position.

Step 2: Self-Learning Test

The Self-Learning test is made up of two separate functions:

- Engine Flywheel Self-Learning Procedure
- AMT Electronic Control System Self-Learning Procedure

Engine Flywheel Self-Learning Procedure

1. With the vehicle stopped, turn the ignition switch on for 20 seconds.
2. Press the brake pedal, start the engine and warm it to more than 80°C.
3. With the transaxle in the Neutral position, quickly press the accelerator and raise the engine speed over 5500 RPM.
4. Release the accelerator and allow the engine to idle.
5. Repeat the procedure at least 3 times until the MIL lamp (engine fault lamp in instrument cluster) stops flashing and is turned off.
6. Turn the ignition switch OFF for 1 minute to store the self-learned value.

AMT Electronic Control System Self-Learning Procedure

1. Connect the X-431 scan tool to the Data Link Connector (DLC).
2. Turn the ignition switch ON.
3. Select ″Gear self-learning″ and wait for approximately 3 minutes until the self-learning procedure is successfully.
4. Turn the ignition switch OFF for 15 seconds to store the self-learned value.
5. Turn the ignition switch ON and put the AMT to the Neutral position.
6. Select ″Clutch point of initial slippery self-learning″.
7. Start engine and wait for 15 seconds.
8. Turn the ignition switch OFF for 15 seconds to store the self-learned value.

Step 3: Road Test

1. Start the engine.
2. Run the engine and warm it to more than 80°C.
3. Drive the vehicle.
4. Accelerate the vehicle, allow the clutch to reach 130°C.
5. Stop the vehicle.
6. Press the accelerator pedal 30%, and increase the engine speed to more than 2500 RPM, and allow the vehicle to self-learn.
7. Turn the ignition switch off.
8. After several seconds, the system will be shut off automatically.

Diagnostic Trouble Code (DTC) List

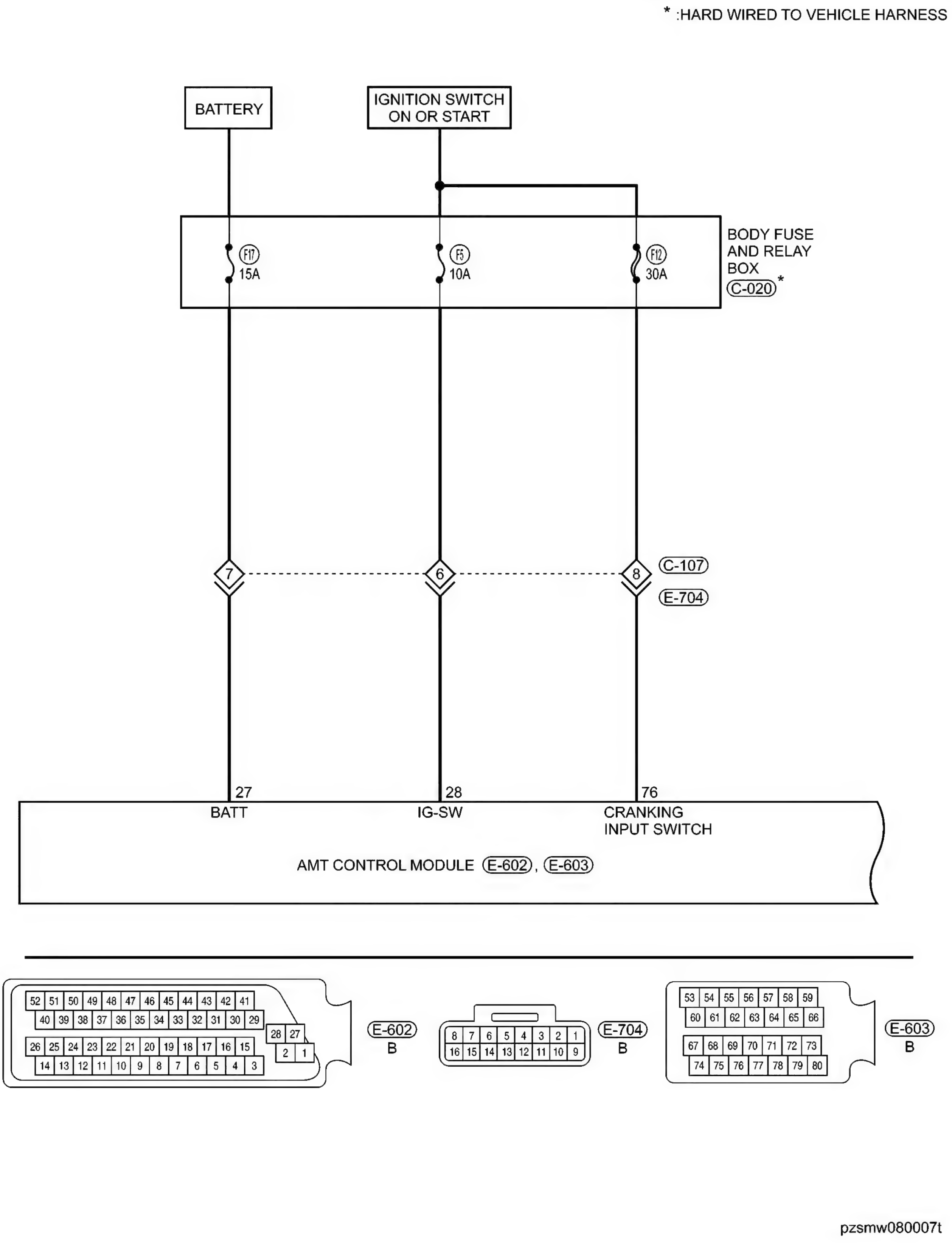
Automated Manual Transaxle DTC List

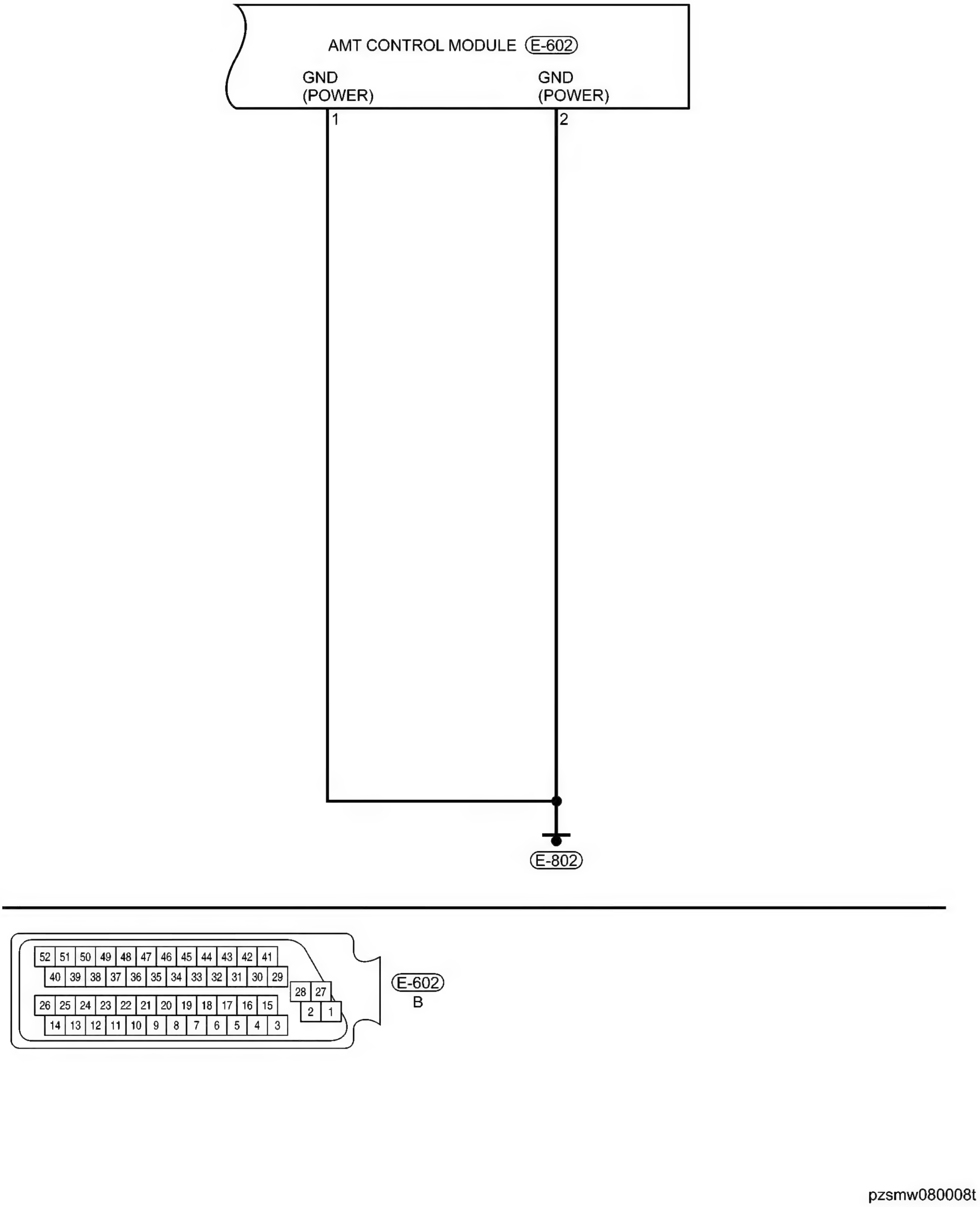
DTC	DTC DEFINITION
P0560	Battery Voltage Too Low
P0561	Battery Voltage Too Low
P0604	Micro Processor Error
P060C	Main Micro Processor Error (MMP)
P0613	Safety Micro Processor Error (SMP)
P0701	Driver Drive Custom (Speedy)
P0703	Brake Switch From CAN
P0710	Engine Water Temperature or External Air Temperature
P0715	Clutch Speed
P0719	Brake Switch From Wire
P0720	Vehicle Speed
P0725	Engine Speed
P0750	Drive Current of EV For Engage Odd Gear
P0755	Drive Current of EV For Engage Even Gear
P0780	Misuse of System
P0805	Clutch Position Sensor (Circle The Primary)
P0806	Clutch Position Sensor
P0807	Clutch Position Sensor (Wrong Value)
P0810	Clutch Position Sensor Conditioner Custom (Faster)
P0817	KI 15
P081A	Cranking Enable
P0820	Gear Switch Lever - GSL 0
P0821	Gear Switch Lever - GSL 1
P0822	Gear Switch Lever - GSL 2
P0823	Gear Switch Lever - GSL 3
P0825	Gear Switch Lever Plausibility
P0880	TCU + 5V Supply
P0881	TCU + 12V Supply
P0900	EV Clutch
P0904	Gear Position Sensor
P0914	Shift Position Sensor
P0932	Hydraulic Pressure Sensor
P0933	Hydraulic Circuit
P0942	Hydraulic Circuit
P0945	Hydraulic Pump Electrical Supply and Relay
P1215	Door Switch From Wire
P1749	Paddles Input
P2712	Hydraulic Circuit Leakage
P2900	ECO Switch
P2901	Hydraulic Circuit

DTC	DTC DEFINITION
P2902	TCU Ground (Pin 1 and 2)
P2903	Gas Pedal Position Error From CAN
P2904	Clutch Error
P2905	Gearbox Error
P2906	Generated Engine Torque From CAN
P2907	Engine Maximum Torque From CAN
P2908	Clutch Error
P2909	Gearbox Error
P290A	Gear Position Sensor Error
P290D	Shift Electro Valves For Low Rank
P290E	Shift Electro Valves For High Rank
U1601	NCR State
U1700	NBC State
U1701	NCM State

Diagnostic Trouble Code (DTC) Tests

P0560 - Battery Voltage Too Low


* :HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
BODY FUSE AND RELAY BOX
C-020 *
F17 15A
F5 10A
F12 30A
7
6
8
C-107
E-704
27
BATT
28
IG-SW
76
CRANKING INPUT SWITCH
AMT CONTROL MODULE E-602, E-603
52 51 50 49 48 47 46 45 44 43 42 41
40 39 38 37 36 35 34 33 32 31 30 29
28 27
26 25 24 23 22 21 20 19 18 17 16 15
2 1
14 13 12 11 10 9 8 7 6 5 4 3
E-602
B
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
E-704
B
53 54 55 56 57 58 59
60 61 62 63 64 65 66
67 68 69 70 71 72 73
74 75 76 77 78 79 80
E-603
B
pzsmw080007t


AMT CONTROL MODULE (E-602)
GND (POWER)
1
GND (POWER)
2
E-802
52 51 50 49 48 47 46 45 44 43 42 41
40 39 38 37 36 35 34 33 32 31 30 29
28 27
26 25 24 23 22 21 20 19 18 17 16 15
2 1
14 13 12 11 10 9 8 7 6 5 4 3
E-602
B
pzsmw080008t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0560	Battery voltage too low	Ignition switch: ON	Automated Manual Transaxle (AMT) control module detected that the battery voltage is excessively low.	• Battery • Charging system • Harness is open or shorted • AMT control module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn the ignition switch on.
- With the scan tool, record and erase stored DTCs in the Automated Manual Transaxle (AMT) control module.
- Turn ignition switch off, and then turn the ignition switch on.
- With the scan tool, select view DTC and data stream in the AMT control module.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 08 Transaxle for more information).

NOTE :

- Troubleshoot any Engine Control Module (ECM) charging/cranking DTCs before proceeding.
- The following tools are required to perform the following test:
- X-431 Scan Tool
- Digital Multimeter

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 08 Transaxle for more information).
- Inspect the ground connection E-802 mounting position (See Vehicle Wiring Harness Layout - Engine Control Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace ground connection.

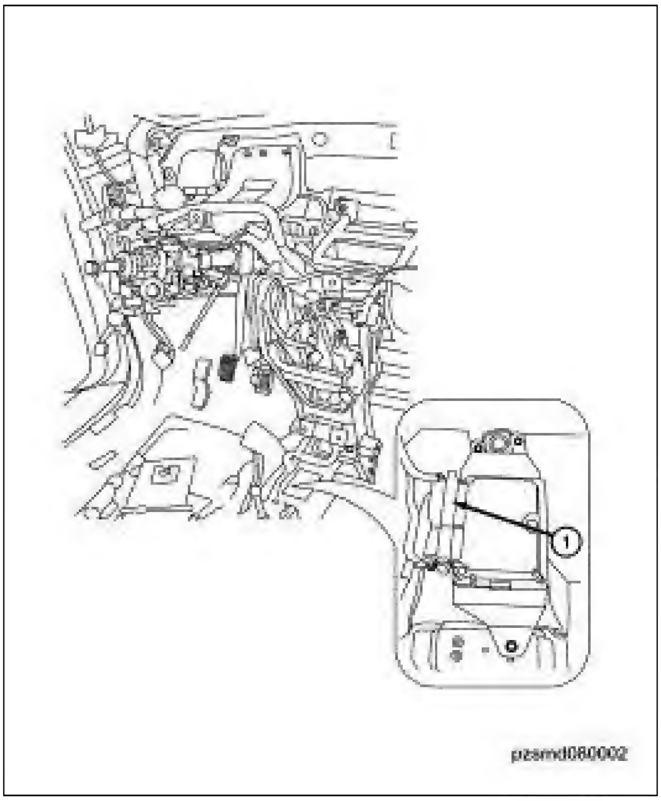
2. CHECK AMT CONTROL MODULE ELECTRICAL CONNECTOR

- Disconnect the AMT control module electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

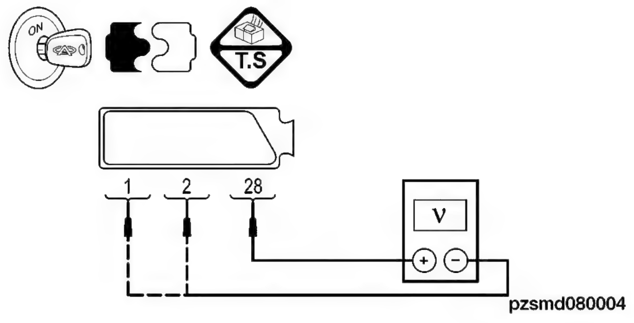
Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

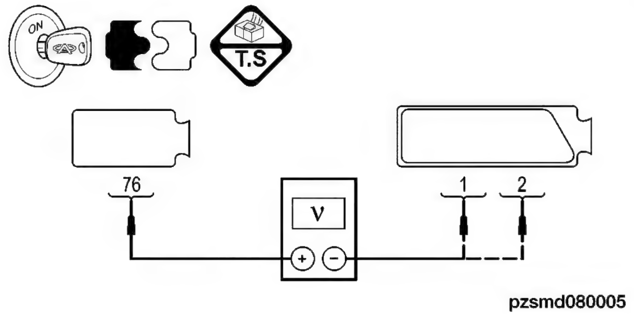


3. CHECK AMT CONTROL MODULE POWER SUPPLY

- Turn ignition switch on.
- Check the voltage between terminal 28 of the AMT control module connector E-602, and terminal 1 & 2 of the AMT control module, terminal side.

AMT CONTROL MODULE CONNECTOR TERMINAL	VOLTAGE	 pzsmd080004
28 and 1 & 2	Less than 9 V	

- Check the voltage between terminal 76 of the AMT control module connector E-603, and terminal 1 & 2 in the AMT control module electrical connector E-602, terminal side.

AMT CONTROL MODULE CONNECTOR TERMINAL	VOLTAGE	 pzsmd080005
76 and 1 & 2	Less than 9 V	

Is the voltage less than 9 V?

Yes >> Go to step 4.

No >> Replace the AMT control module.

4. CHECK SYSTEM VOLTAGE

- Start the engine, raise the engine speed to above 1000 RPM.
- Measure the charging system voltage at the battery positive and negative terminals.

Is the voltage less than 9 V?

Yes >> Check the charging system.

No >> Go to the next step.

5. CHECK THE BATTERY

- Maintain engine speed above 1000 RPM for a few minutes.
- Turn ignition switch off.
- Measure the voltage drop at the battery positive and negative terminals while cranking the engine.
- Battery voltage should be more than approximately 9.0 V.

Is the check result normal?

Yes >> Go to step 6.

No >> Charge or replace the battery.

6. CHECK AMT CONTROL MODULE SUPPLY CIRCUIT

- Turn the ignition switch off.
- Disconnect the battery positive terminal.
- Measure continuity between the AMT control module connector terminal 25 and the battery positive terminal.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Check fuse.
Check the electrical harness for an open or high resistance.

7. CHECK DTC

- With the X-431 scan tool, read AMT control module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC P0560 still present?

Yes >> Replace the AMT control module (See AMT control module Removal & Installation in Section 08 Transaxle).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0604 - Micro Processor Error
P060C - Main Micro Processor Error (MMP)
P0613 - Safety Micro Processor Error (SMP)

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0604	Micro processor error	Ignition switch: ON	• Automated Manual Transaxle (AMT) control module detected an internal failure. • If the DTC was set, then the AMT can be only shifted up to 3rd gear forcibly.	• Harness is open or shorted • AMT control module
P060C	Main micro processor error (MMP)			
P0613	Safety micro processor error (SMP)			

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the Automated Manual Transaxle (AMT) control module.
- Turn ignition switch off, and then turn the ignition switch on.
- With the scan tool, select view DTC and data stream in the AMT control module.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 08 Transaxle for more information).

NOTE :

- Troubleshoot any Engine Control Module (ECM) charging/cranking DTCs before proceeding.
- The following tools are required to perform the following test:
- X-431 Scan Tool
- Digital Multimeter

Diagnostic Procedure

1. CHECK DTC

- Perform DTC confirmation procedure.

Is DTC P0604, P060C or P0613 present?

Yes >> Go to the next step.

No >> The conditions that caused this DTC to set are not present at this time (See Diagnostic Help in Section 08 Transaxle).

2. CHECK AMT CONTROL MODULE POWER SUPPLY AND GROUND CIRCUIT

- Check the AMT control module voltage supply and ground circuits for an open, high resistance or short circuits.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair the circuit for an open or shorts as necessary.

3. CHECK DTC

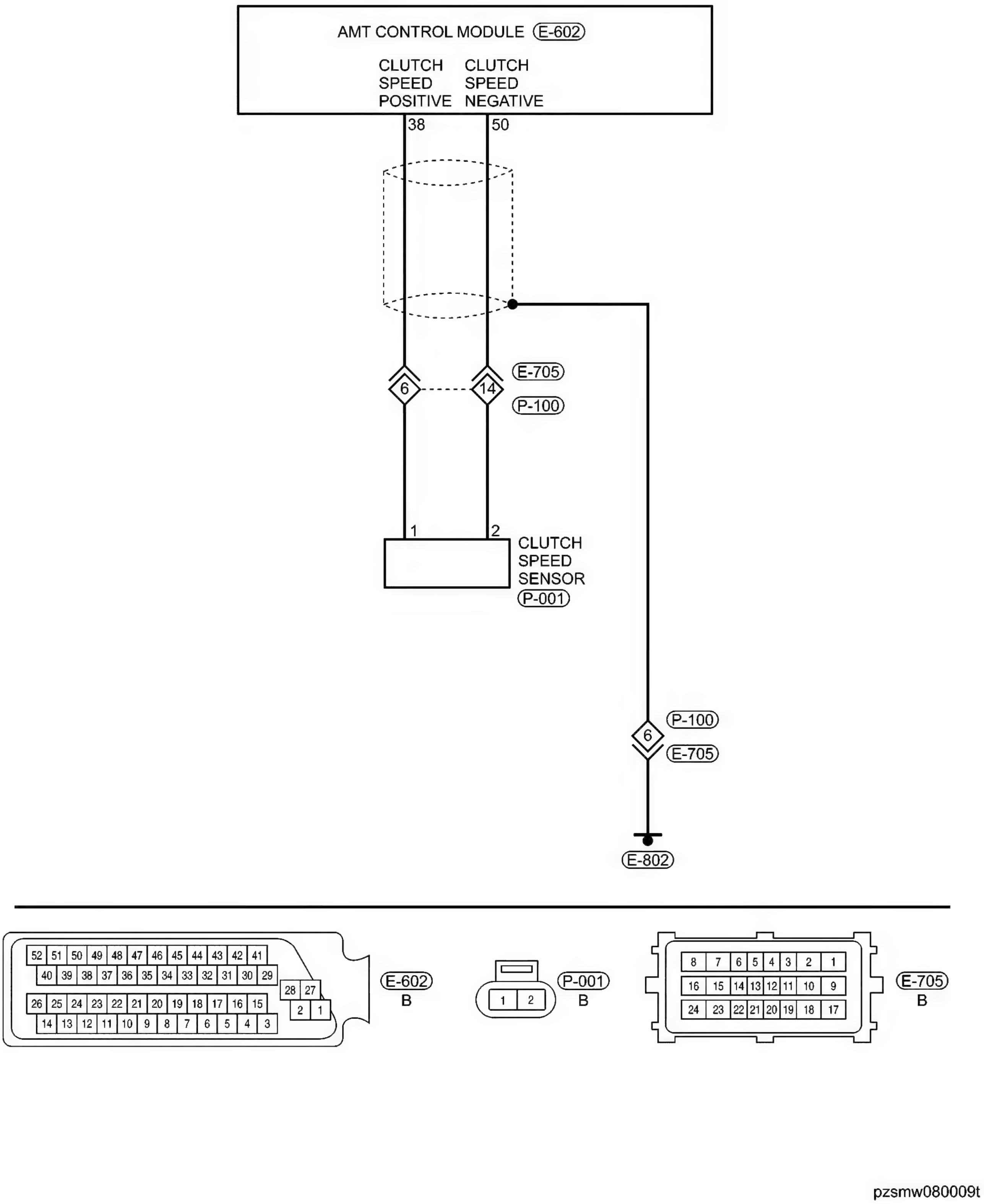
- With the X-431 scan tool, read AMT control module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC P0604, P060C or P0613 still present?

Yes >> Replace the AMT control module (See AMT Control Module Removal & Installation in Section 08 Transaxle).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P0715 - Clutch Speed


AMT CONTROL MODULE (E-602)
CLUTCH SPEED POSITIVE
CLUTCH SPEED NEGATIVE
38
50
(E-705)
6
14
(P-100)
1
2
CLUTCH SPEED SENSOR
(P-001)
(P-100)
6
(E-705)
(E-802)
(E-602)
B
(P-001)
B
(E-705)
B
pzsmw080009t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
P0715	Clutch speed	Vehicle is driving	• The Automated Manual Transaxle (AMT) control module will set this DTC if the AMT control module does not receive a pulse signal from the clutch speed sensor, or the pulse signal is incorrect when the vehicle is driving. • If this DTC is set, the AMT can only be shifted up to 3rd gear forcibly.	• Clutch speed sensor • Clutch position sensor • Clutch skid • Harness or connectors (The sensor circuit is open or shorted) • Automated Manual Transaxle internal fault • AMT control module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the Automated Manual Transaxle (AMT) control module.
- Start the engine and warm it to normal operating temperature.
- Drive the vehicle up to 10 km/h or more.
- With the scan tool, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 08 Transaxle for more information).

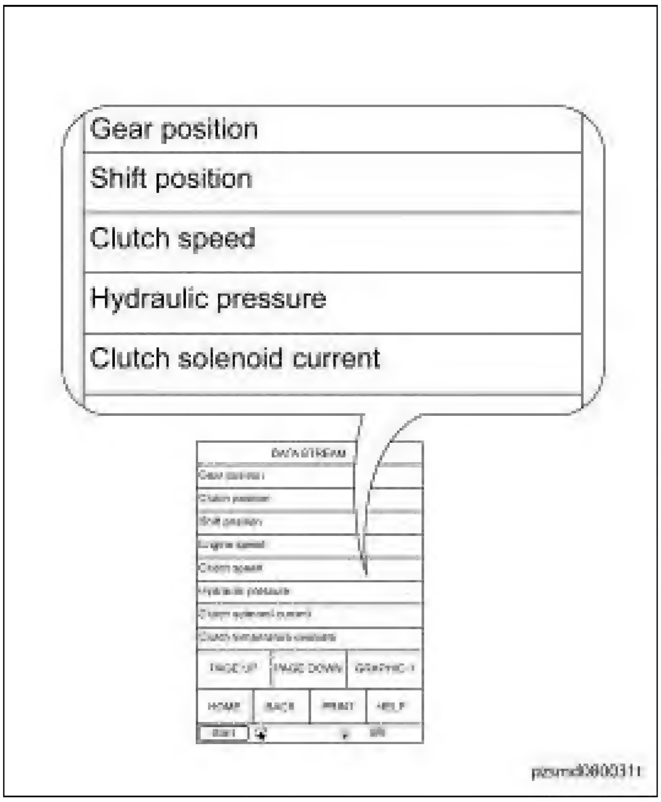
NOTE :

- If DTC P0720 or P0805 are also present, diagnose and repair them before continuing with this test.
- Using the appropriate diagnostic test tool, you can diagnose the AMT control module harness while the AMT control module is still connected. This will help prevent electrical connector terminal damage.

Diagnostic Procedure

1. CHECK AMT INPUT SIGNAL

- With the scan tool, select view DTC and data stream for AMT.
- Start the engine and read the value of the clutch speed sensor.


Gear position
Shift position
Clutch speed
Hydraulic pressure
Clutch solenoid current
DATA STREAM
PAGE UP
PAGE DOWN
GRAPHIC-1
HOME
BACK
PRINT
HELP
pzsmd080031t

ITEM	CONDITION	DISPLAY VALUE
Clutch speed sensor	During driving	Approximately matches the engine speed.

Is the check result normal?

Yes >> The conditions that caused this DTC to set are not present at this time (See Diagnostic Help in Section 08 Transaxle).

No >> Go to the next step.

2. CHECK CLUTCH SPEED SENSOR ELECTRICAL CONNECTOR

- Stop the vehicle and turn ignition switch off.
- Disconnect clutch speed sensor electrical connector.
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

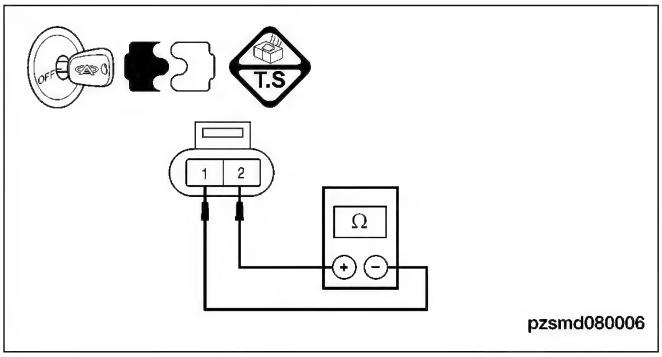
3. CHECK CLUTCH SPEED SENSOR RESISTANCE

- Check the resistance between clutch speed sensor terminal 1 and 2 in the sensor electrical connector.
- 450 ± 50 Ω (20 °C) should exist.

Is the check result normal?

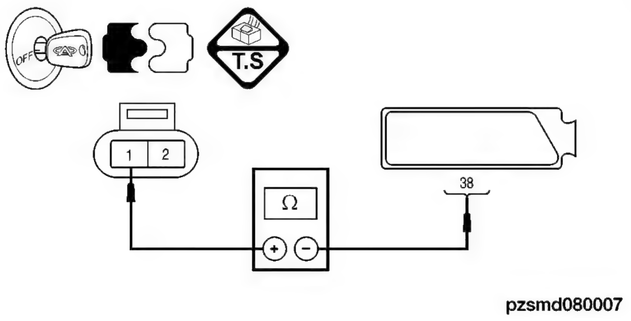
Yes >> Go to the next step.

No >> Replace the sensor.

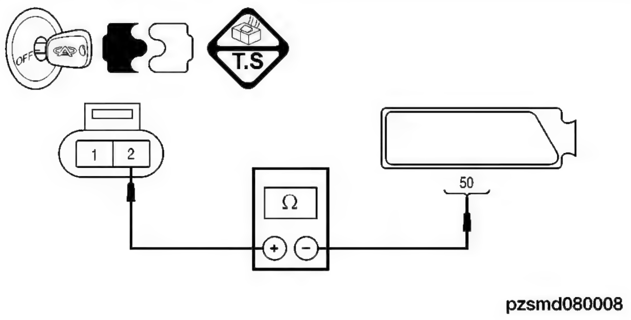


4. CHECK CLUTCH SPEED SENSOR SIGNAL CIRCUIT

- Turn ignition switch off.
- Disconnect the AMT control module electrical connector.
- Check the continuity between the clutch speed sensor terminal 1 and the AMT control module electrical connector terminal 38.

CLUTCH SPEED SENSOR TERMINAL	AMT CONTROL MODULE	CONTINUITY	
1	38	Yes	

- Check the continuity between the clutch speed sensor terminal 2 and the AMT control module electrical connector terminal 50.

CLUTCH SPEED SENSOR TERMINAL	AMT CONTROL MODULE	CONTINUITY	
2	50	Yes	

- Check the harness for a short to power and short to ground.

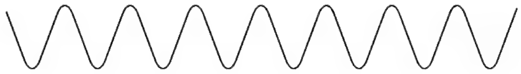
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to power or short to ground.

5. CHECK CLUTCH SPEED SENSOR SIGNAL

- Connect the AMT control module and clutch speed sensor electrical connectors.
- Start the vehicle and perform the following:
  - Engine: 2000 RPM
  - Vehicle: 50 km/h
  - Gear: 3
- Check the clutch speed sensor signal between sensor terminal 1 or 2 and ground in the sensor electrical connector with an oscilloscope.
- Make sure the wave shape and signal voltage is normal.

	CLUTCH SPEED SENSOR SIGNAL
ENGINE ANALYZER (KES-200)	 pzsmd080016

Is the check result normal?

Yes >> Go to step 9.

No >> Go to the next step.

6. CHECK CLUTCH SPEED SENSOR

- Loosen the sensor mounting bolt.
- Remove the sensor.
- Visually inspect the sensor for any missing, chipped or damaged components.
- Visually inspect for interference between the AMT clutch signal ring and clutch speed sensor.

Is the check result normal?

Yes >> Replace the clutch speed sensor.
Monitor the clutch speed sensor signal on the oscilloscope.
- If the clutch speed sensor signals were normal, the system is OK.
- If the clutch speed sensor signals were still irregular or missing, go to step 7.

No >> Replace the clutch speed sensor and repair the AMT signal ring if needed (excessive run-out of the signal ring in the AMT could result in interference between the signal ring and the sensor causing damage to the sensor).

7. CHECK THE CLUTCH

- Disassemble and inspect the clutch.
- Check the clutch surface for wearing (See Clutch and Pressure Plate Removal & Installation in Section 08 Transaxle).
- Check for a chipped and damaged signal ring for the clutch.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the clutch and perform the self learning process for clutch engagement points and gears.
Monitor the clutch speed sensor signal on the oscilloscope.
If the signal pulse is not normal, go to the next step.

8. CHECK THE CLUTCH SHAFT

- Check the clutch during the specific operating condition (such as shifting from 1st gear to reverse gear, and shifting from reverse gear to neutral gear).
- This condition would lead to a difference in speed between the engine speed and clutch speed.

Is the check result normal?

Yes >> Go to the next step.

No >> Re-flash the AMT control module with the latest version (the purpose is to increase the judgment threshold value).

9. CHECK DTC

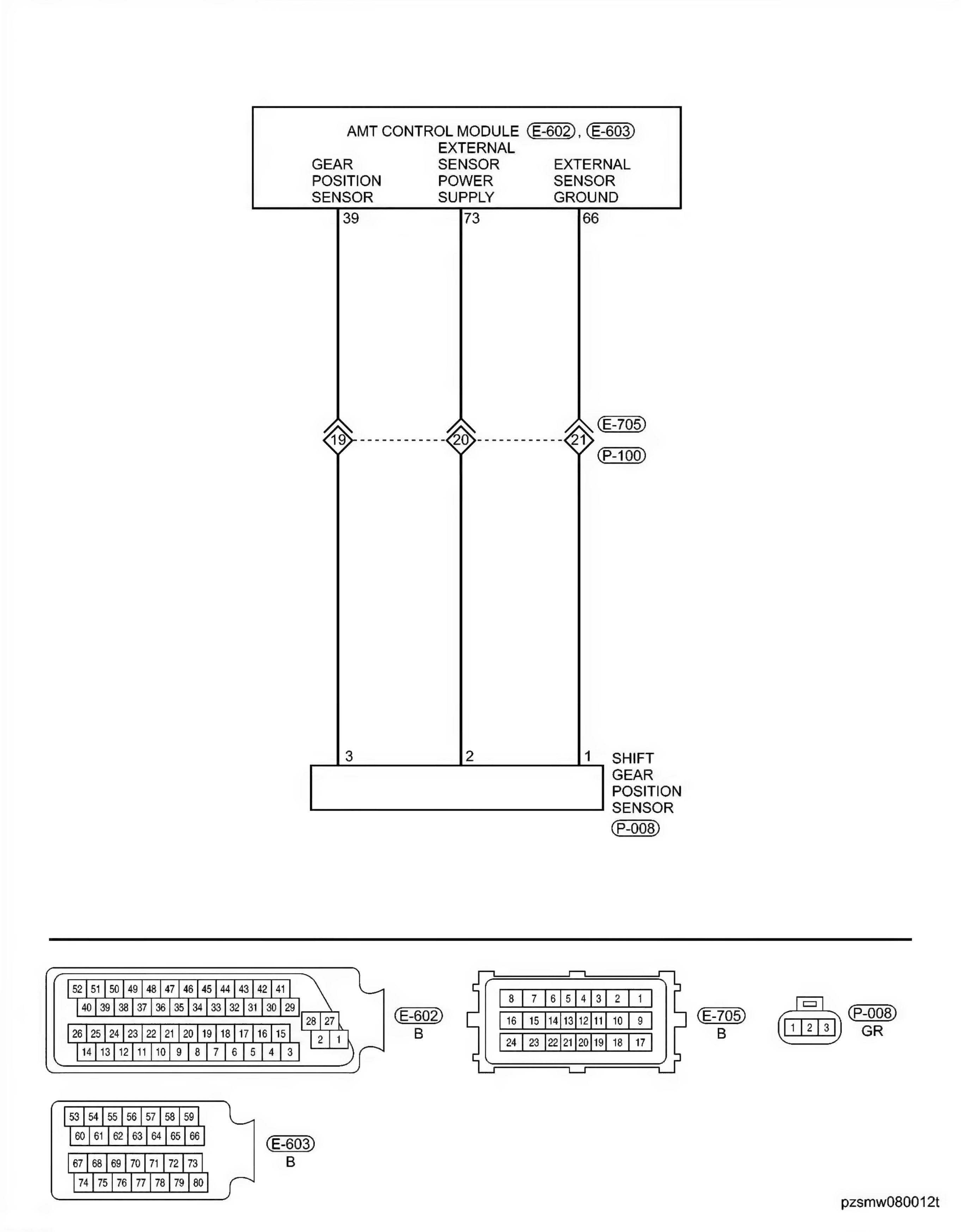
- With the X-431 scan tool, read AMT control module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is the check result normal?

Yes >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

No >> Replace the AMT control module (See AMT Control Module Removal & Installation in Section 08 Transaxle).

P0904 - Gear Position Sensor


AMT CONTROL MODULE (E-602), (E-603)
GEAR POSITION SENSOR
EXTERNAL SENSOR POWER SUPPLY
EXTERNAL SENSOR GROUND
39
73
66
19
20
21
(E-705)
(P-100)
3
2
1
SHIFT GEAR POSITION SENSOR
(P-008)
(E-602)
B
(E-705)
B
(P-008)
GR
(E-603)
B
pzsmw080012t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSES
P0904	Gear position sensor	Engine is running	• The Automated Manual Transaxle (AMT) control module detects that the voltage is out of the acceptable range. • If this DTC is set, the AMT can only be shifted up to 3rd gear forcibly.	• Gear position sensor • Harness or connectors (The sensor circuit is open or shorted) • AMT control module • AMT electro-mechanical control unit

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the Automated Manual Transaxle (AMT) control module.
- Start the engine and warm it to normal operating temperature.
- Drive the vehicle and attempt to operate the gear selection lever to every gear condition required for this test.
- With the scan tool, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 08 Transaxle for more information).

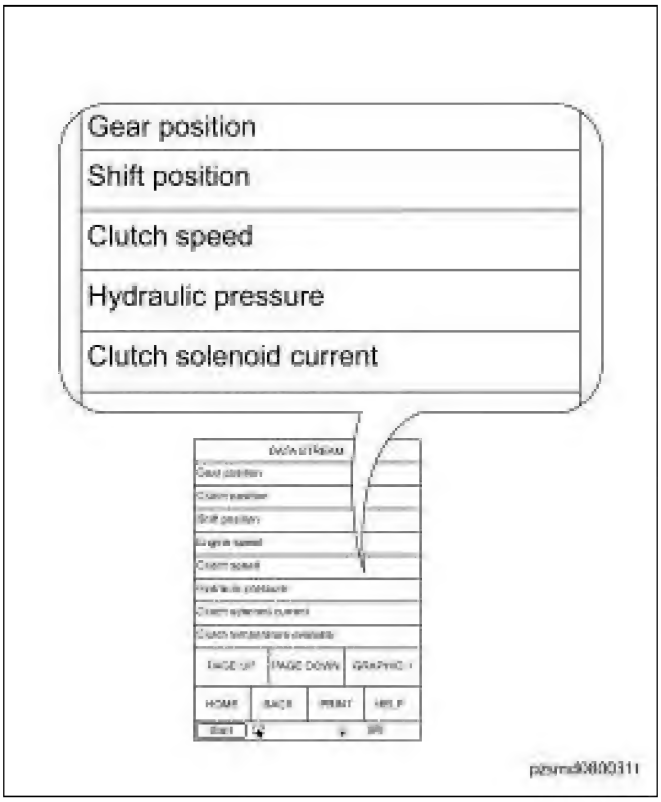
NOTE :

- Using the appropriate diagnostic test tool, you can diagnose the AMT control module harness while the AMT control module is still connected. This will help prevent electrical connector terminal damage.

Diagnostic Procedure

1. CHECK GEAR POSITION SENSOR SIGNAL

- With the scan tool, select view DTC and data stream for AMT.
- Start vehicle and monitor the value of ″GEAR POSITION″.


Gear position
Shift position
Clutch speed
Hydraulic pressure
Clutch solenoid current
PAGE DOWN
pzumd0800311

GEAR	CONDITION	DISPLAY VALUE
1st	Vehicle is driving	OK
2nd		
3rd		
4th		
5th		

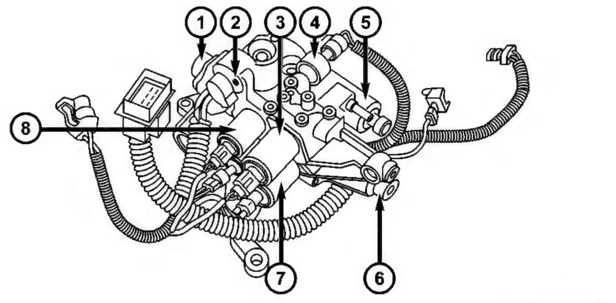
Is the check result normal?

Yes >> The conditions that caused this DTC to set are not present at this time (See Diagnostic Help in Section 08 Transaxle).

No >> Go to the next step.

2. CHECK GEAR POSITION SENSOR ELECTRICAL CONNECTOR

- Stop the vehicle and turn ignition switch off.
- Disconnect the gear position sensor electrical connector P-008 (1).
- Inspect the electrical connector for damage.

<table>
<tr><th>NUMBER</th><th>SOLENOID/SENSOR</th><td rowspan="9">

pzsmd080001</td></tr>
<tr><td>1</td><td>Gear position sensor</td></tr>
<tr><td>2</td><td>Shift position sensor</td></tr>
<tr><td>3</td><td>Clutch solenoid valve</td></tr>
<tr><td>4</td><td>Hydraulic pressure sensor</td></tr>
<tr><td>5</td><td>Gear solenoid valve</td></tr>
<tr><td>6</td><td>Clutch position sensor</td></tr>
<tr><td>7</td><td>Gear solenoid valve</td></tr>
<tr><td>8</td><td>Shift solenoid valve</td></tr>
</table>

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

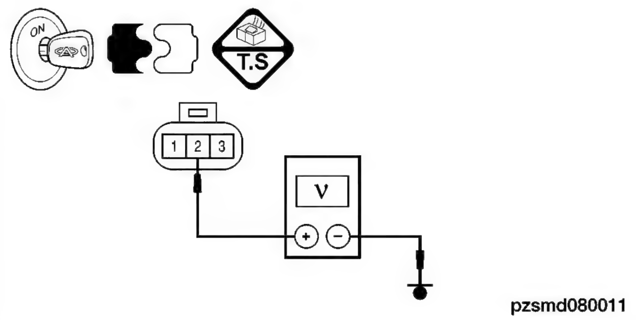
3. CHECK GEAR POSITION SENSOR POWER SUPPLY

- Turn ignition switch on.
- Check power supply between terminal 2 of the gear position sensor connector P-008, terminal side and ground.
- 5 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to power or short to ground.



pzsmd080011

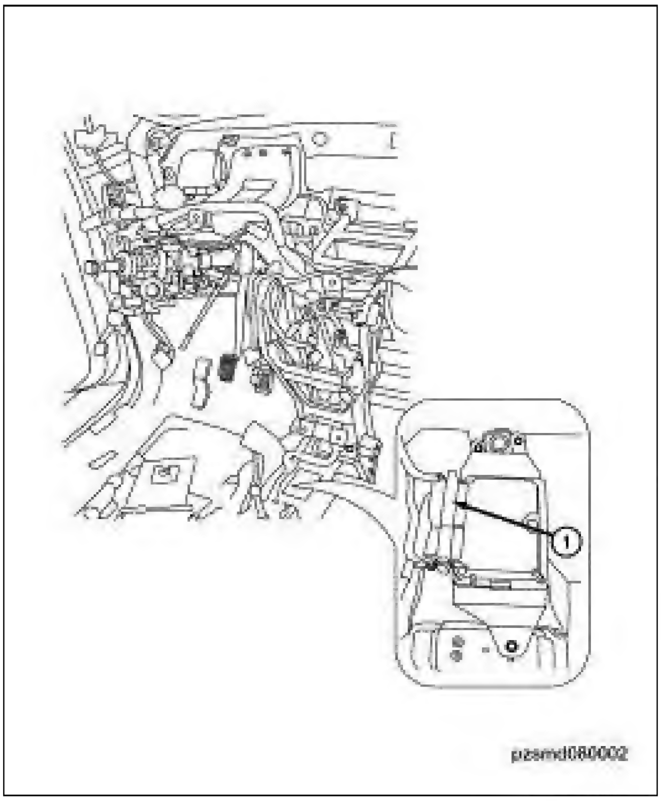
4. CHECK SENSOR GROUND CIRCUIT

- Disconnect the AMT control module (1) electrical connector E-602 and E-603.
- Check the continuity between terminal 1 of the gear position sensor connector P-008, and terminal 66 of the AMT control module connector E-603, terminal side.
- Check the sensor ground circuit for a short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair the circuit for an open or short to power in the harness or connectors.



5. CHECK GEAR POSITION SENSOR SIGNAL CIRCUIT

- Check the continuity between terminal 3 of the gear position sensor connector P-008, and terminal 39 of the AMT control module connector E-602, terminal side.
- Continuity should exist.
- Check the signal circuit for a short to ground and short to power supply.

Is the check result normal?

Yes >> Go to step 6.

No >> Check the harness for an open or short to ground or short to power supply in harness or connectors.

6. CHECK THE GEAR POSITION SENSOR

- Replace the gear position sensor with a known good sensor.
- Start the vehicle and monitor the value of "GEAR POSITION" with the X-431 scan tool.

Is the check result normal?

Yes >> Go to the next step.

No >> Check the AMT gear condition, the gap between the sensor and the signal component, the gear selection lever.

7. CHECK DTC

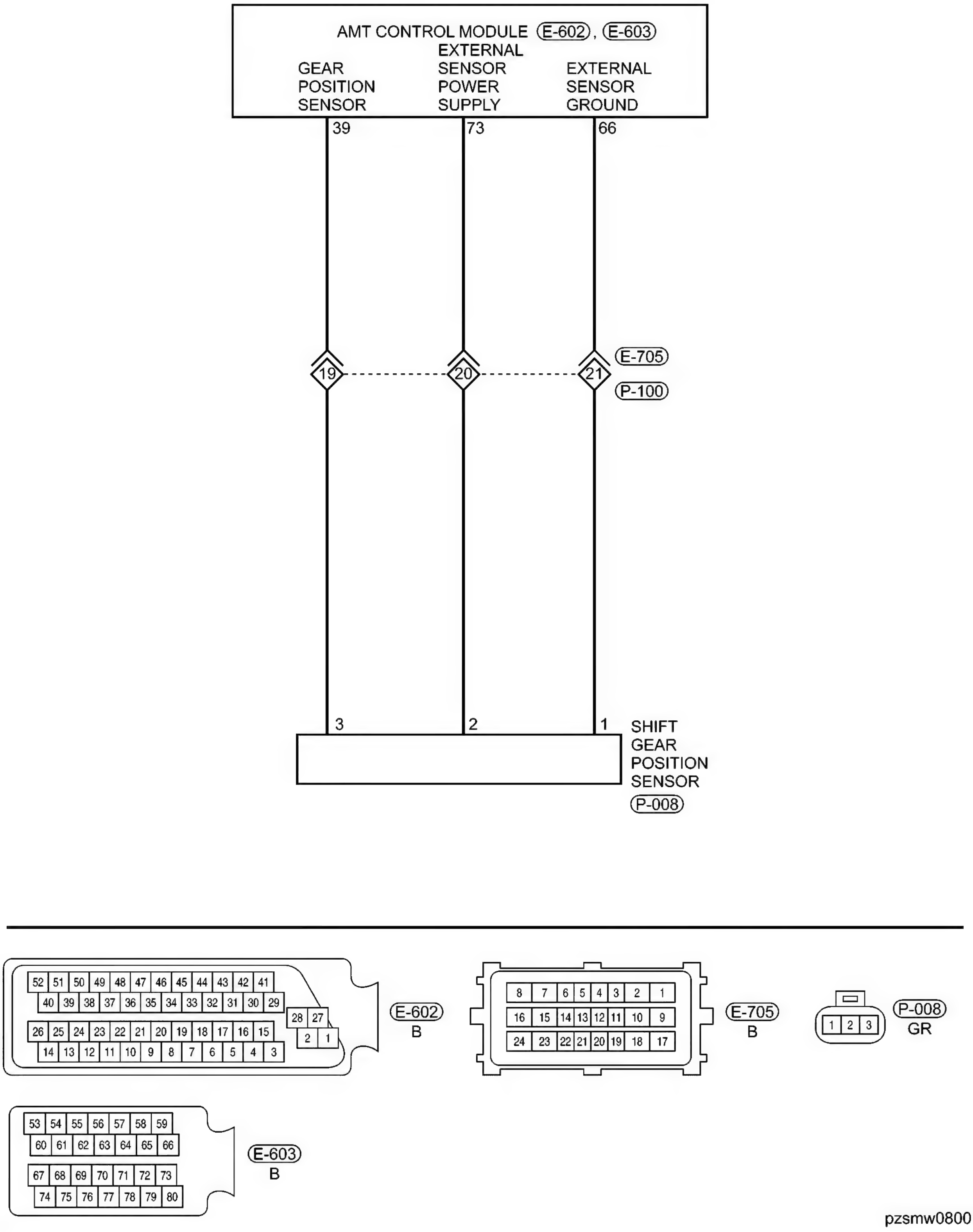
- With the X-431 scan tool, read AMT control module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is the check result normal?

Yes >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

No >> Replace the AMT control module (See AMT Control Module Removal & Installation in Section 08 Transaxle).

P0914 - Shift Position Sensor


AMT CONTROL MODULE E-602, E-603
GEAR POSITION SENSOR
EXTERNAL SENSOR POWER SUPPLY
EXTERNAL SENSOR GROUND
39
73
66
19
20
21
E-705
P-100
3
2
1
SHIFT GEAR POSITION SENSOR
P-008
E-602
B
E-705
B
P-008
GR
E-603
B
pzsmw080012t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSES
P0914	Shift position sensor	Engine is running	• The Automated Manual Transaxle (AMT) control module detects that the voltage is out of the acceptable range. • If this DTC is set, the AMT can only be shifted up to 3rd gear forcibly.	• Gear position sensor • Harness or connectors (The sensor circuit is open or shorted) • AMT control module • AMT electro-mechanical control unit

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the Automated Manual Transaxle (AMT) control module.
- Start the engine and warm it to normal operating temperature.
- Drive the vehicle and attempt to operate the gear selection lever to every gear condition required for this test.
- With the scan tool, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 08 Transaxle for more information).

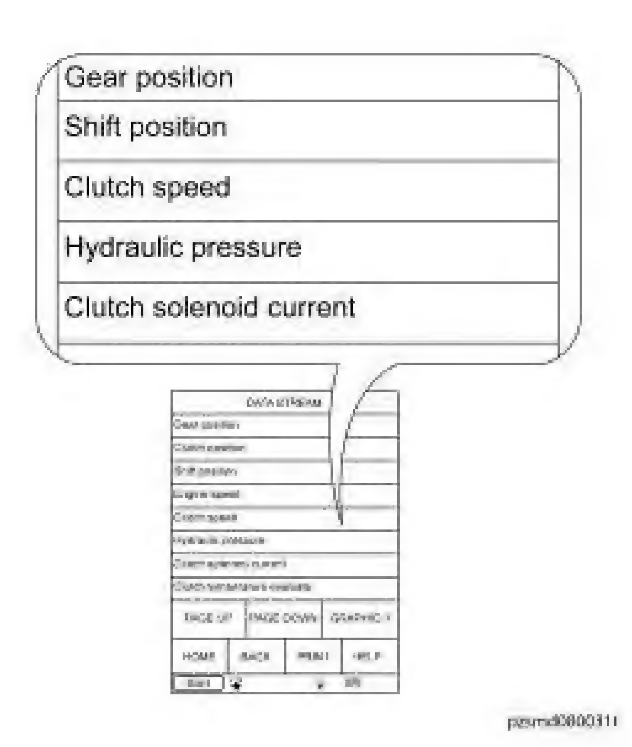
NOTE :

- Using the appropriate diagnostic test tool, you can diagnose the AMT control module harness while the AMT control module is still connected. This will help prevent electrical connector terminal damage.

Diagnostic Procedure

1. CHECK SHIFT POSITION SENSOR SIGNAL

- With the scan tool, select view DTC and data stream for AMT.
- Start vehicle and monitor the value of ″SHIFT POSITION″.


Gear position
Shift position
Clutch speed
Hydraulic pressure
Clutch solenoid current
DATA STREAM
PAGE UP
PAGE DOWN
HOME
BACK
PRINT
HELP
pzsmd0800311

GEAR	CONDITION	DISPLAY VALUE
1st	Vehicle is driving	OK
2nd		
3rd		
4th		
5th		

Is the check result normal?

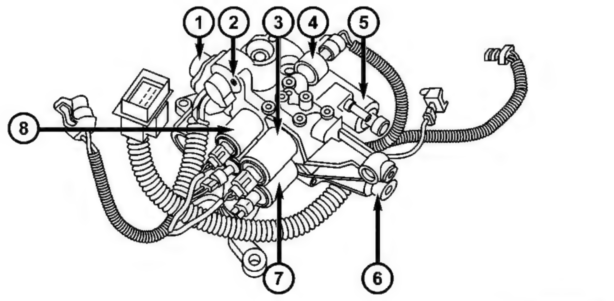
Yes >> The conditions that caused this DTC to set are not present at this time (See Diagnostic Help in Section 08 Transaxle).

No >> Go to the next step.

2. CHECK SHIFT POSITION SENSOR ELECTRICAL CONNECTOR

- Stop the vehicle and turn ignition switch off.
- Disconnect the shift position sensor electrical connector P-007 (2).
- Inspect the electrical connector for damage.

NUMBER	SOLENOID/SENSOR
1	Gear position sensor
2	Shift position sensor
3	Clutch solenoid valve
4	Hydraulic pressure sensor
5	Gear solenoid valve
6	Clutch position sensor
7	Gear solenoid valve
8	Shift solenoid valve



pzsmd080001

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

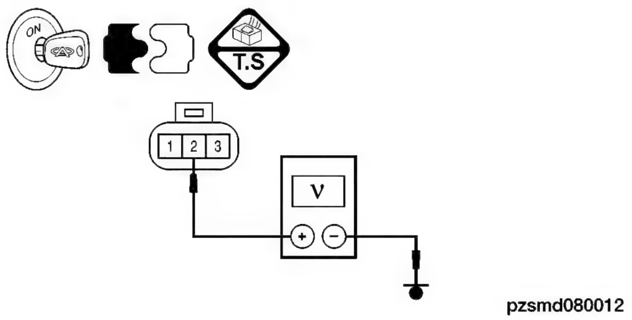
3. CHECK SHIFT POSITION SENSOR POWER SUPPLY

- Turn ignition switch on.
- Check power supply between terminal 2 of the shift position sensor connector P-007, terminal side and ground.
- 5 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to power or short to ground.



pzsmd080012

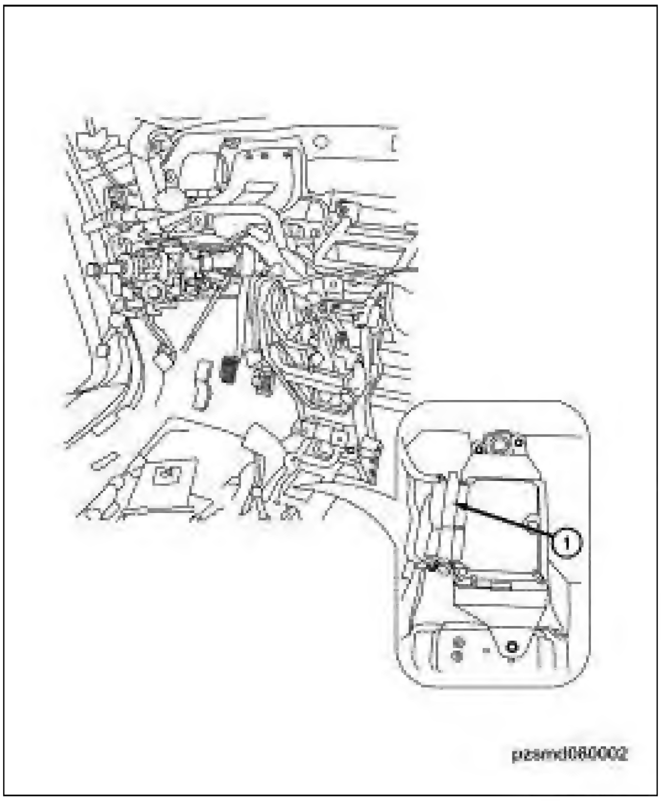
4. CHECK SENSOR GROUND CIRCUIT

- Disconnect the AMT control module (1) electrical connector E-602 and E-603.
- Check the continuity between terminal 1 of the shift position sensor connector P-007, and terminal 66 of the AMT control module connector E-603, terminal side.
- Check the sensor ground circuit for a short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair the circuit for an open or short to power in the harness or connectors.



5. CHECK SHIFT POSITION SENSOR SIGNAL CIRCUIT

- Check the continuity between terminal 3 of the shift position sensor connector P-007, and terminal 51 of the AMT control module connector E-602, terminal side.
- Continuity should exist.
- Check the signal circuit for a short to ground and short to power supply.

Is the check result normal?

Yes >> Go to step 6.

No >> Check the harness for an open or short to ground or short to power supply in harness or connectors.

6. CHECK THE SHIFT POSITION SENSOR

- Replace the shift position sensor with a known good sensor.
- Start the vehicle and monitor the value of ″SHIFT POSITION″ with the X-431 scan tool.

Is the check result normal?

Yes >> Go to the next step.

No >> Check the AMT gear condition, the gap between the sensor and the signal component, the gear selection lever.

7. CHECK DTC

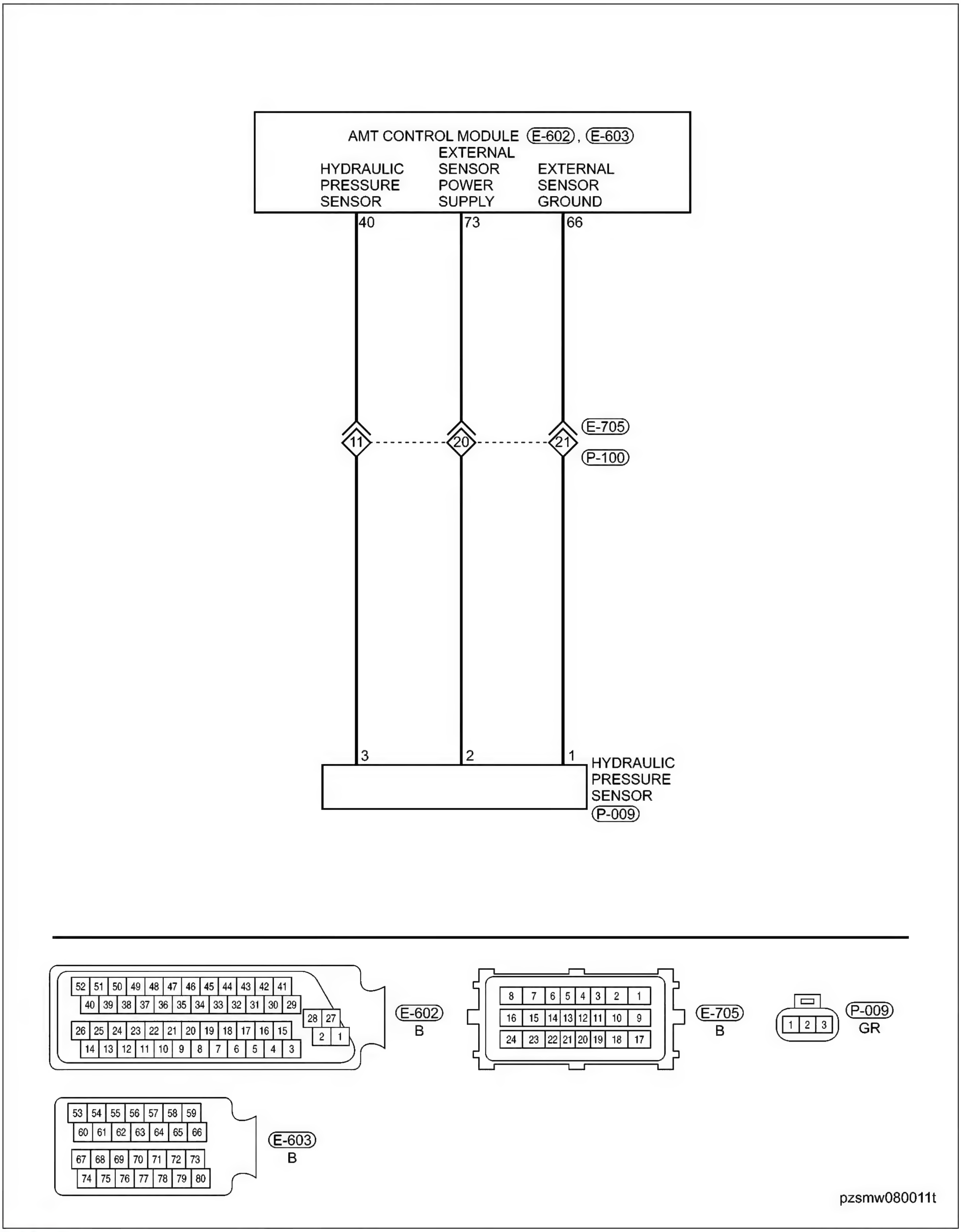
- With the X-431 scan tool, read AMT control module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is the check result normal?

Yes >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

No >> Replace the AMT control module (See AMT Control Module Removal & Installation in Section 08 Transaxle).

P0932 - Hydraulic Pressure Sensor


AMT CONTROL MODULE (E-602), (E-603)
HYDRAULIC PRESSURE SENSOR
EXTERNAL SENSOR POWER SUPPLY
EXTERNAL SENSOR GROUND
40
73
66
11
20
21
E-705
P-100
3
2
1
HYDRAULIC PRESSURE SENSOR
P-009
52 51 50 49 48 47 46 45 44 43 42 41
40 39 38 37 36 35 34 33 32 31 30 29
28 27
26 25 24 23 22 21 20 19 18 17 16 15
2 1
14 13 12 11 10 9 8 7 6 5 4 3
E-602
B
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
24 23 22 21 20 19 18 17
E-705
B
1 2 3
P-009
GR
53 54 55 56 57 58 59
60 61 62 63 64 65 66
67 68 69 70 71 72 73
74 75 76 77 78 79 80
E-603
B
pzsmw080011t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSES
P0932	Hydraulic pressure sensor	Vehicle is driving	• The Automated Manual Transaxle (AMT) control module detects this DTC after the engine speed is up to a specific value for a specific moment and there is a fault with the hydraulic pressure sensor circuit. • If this DTC is set, the AMT can only be shifted up to 3rd gear forcibly.	• AMT hydraulic pressure sensor • Harness or connectors (The sensor circuit is open or shorted) • AMT control module

DTC Confirmation Procedure:

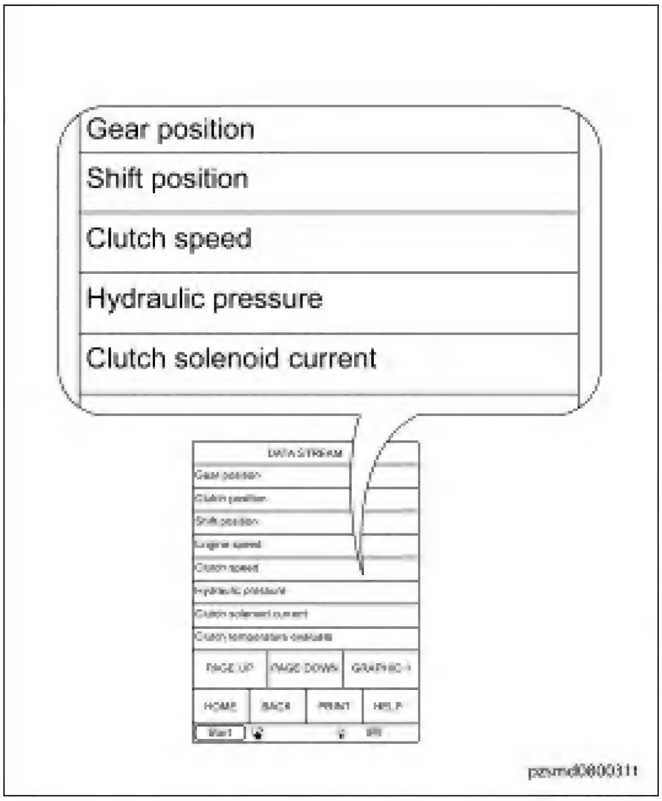
Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the Automated Manual Transaxle (AMT) control module.
- Start the engine and warm it to normal operating temperature.
- Drive the vehicle uphill to maintain the driving conditions required for this test.
- With the scan tool, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 08 Transaxle for more information).

Diagnostic Procedure

1. CHECK HYDRAULIC PRESSURE SENSOR SIGNAL

- With the scan tool, select view DTC and data stream for AMT.
- Start vehicle and monitor the value of ″HYDRAULIC PRESSURE″.


Gear position
Shift position
Clutch speed
Hydraulic pressure
Clutch solenoid current
DATA STREAM
PAGE UP
PAGE DOWN
HOME
BACK
PRINT
HELP
Start
pzsmd080031t

ITEM	CONDITION	DISPLAY VALUE
System Pressure	Idle or driving	40 - 52 bar

Is the check result normal?

Yes >> The conditions that caused this DTC to set are not present at this time (See Diagnostic Help in Section 08 Transaxle).

No >> Go to the next step.

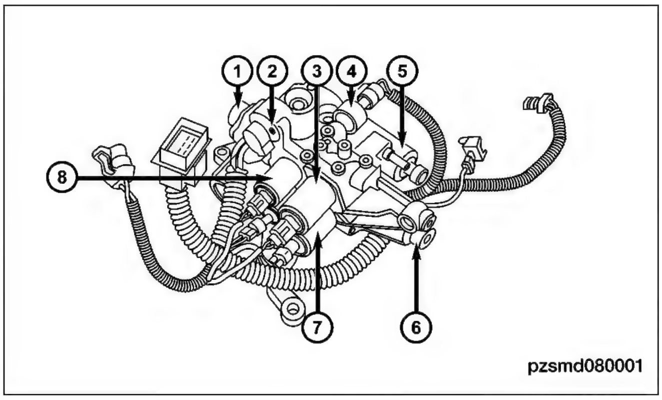
2. CHECK HYDRAULIC PRESSURE SENSOR ELECTRICAL CONNECTOR

- Stop the vehicle and turn ignition switch off.
- Disconnect the hydraulic pressure sensor electrical connector P-009.
- Inspect the electrical connector for damage.

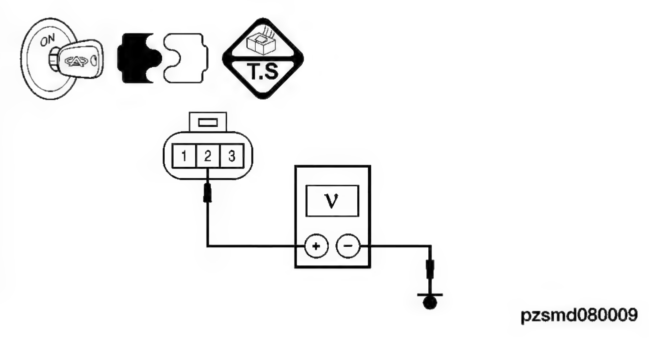
Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.


1
2
3
4
5
8
7
6
pzsmd080001

3. CHECK HYDRAULIC PRESSURE SENSOR POWER SUPPLY



- Turn ignition switch on.
- Check the voltage between hydraulic pressure sensor terminal 2 and ground in the sensor electrical connector P-009, terminal side.
- 5 V should exist.

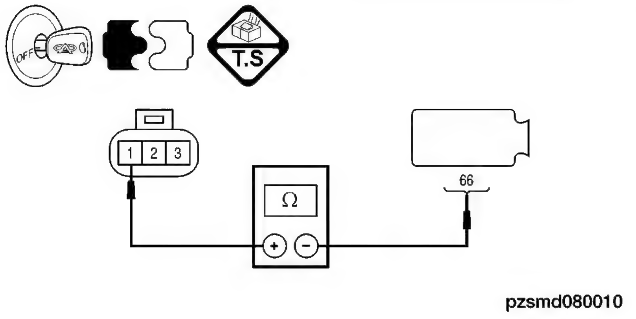
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to power or short to ground.
If circuit is normal, replace the AMT control module (See AMT control module Removal & Installation in Section 08 Transaxle).

4. CHECK HYDRAULIC PRESSURE SENSOR GROUND CIRCUIT

- Turn ignition switch off.
- Disconnect the AMT control module electrical connectors E-602 and E-603.
- Check the continuity between the following terminals:

SYSTEM PRESSURE SENSOR TERMINAL	AMT CONTROL MODULE CONNECTOR TERMINAL	CONTINUITY	 OFF T.S 1 2 3 Ω + − 66 pzsmd080010
1	66	Yes	

- Check the harness for a short to power and a short to ground.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to power or short to ground.

5. CHECK HYDRAULIC PRESSURE SENSOR SIGNAL CIRCUIT

- Check the continuity between terminal 3 of the hydraulic pressure sensor connector P-009, and terminal 40 of the AMT control module electrical connector E-062, terminal side.
- Continuity should exist.
- Check the signal circuit for a short to ground and a short to power supply.

Is the check result normal?

Yes >> Go to step 6.

No >> Check the harness for an open, short to ground or short to power supply in the harness.

6. CHECK THE HYDRAULIC PRESSURE SENSOR

- Replace the hydraulic pressure sensor with a known good sensor.
- Start the vehicle and monitor the value of ″HYDRAULIC PRESSURE″ with the X-431 scan tool.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the hydraulic pressure sensor.

7. CHECK DTC

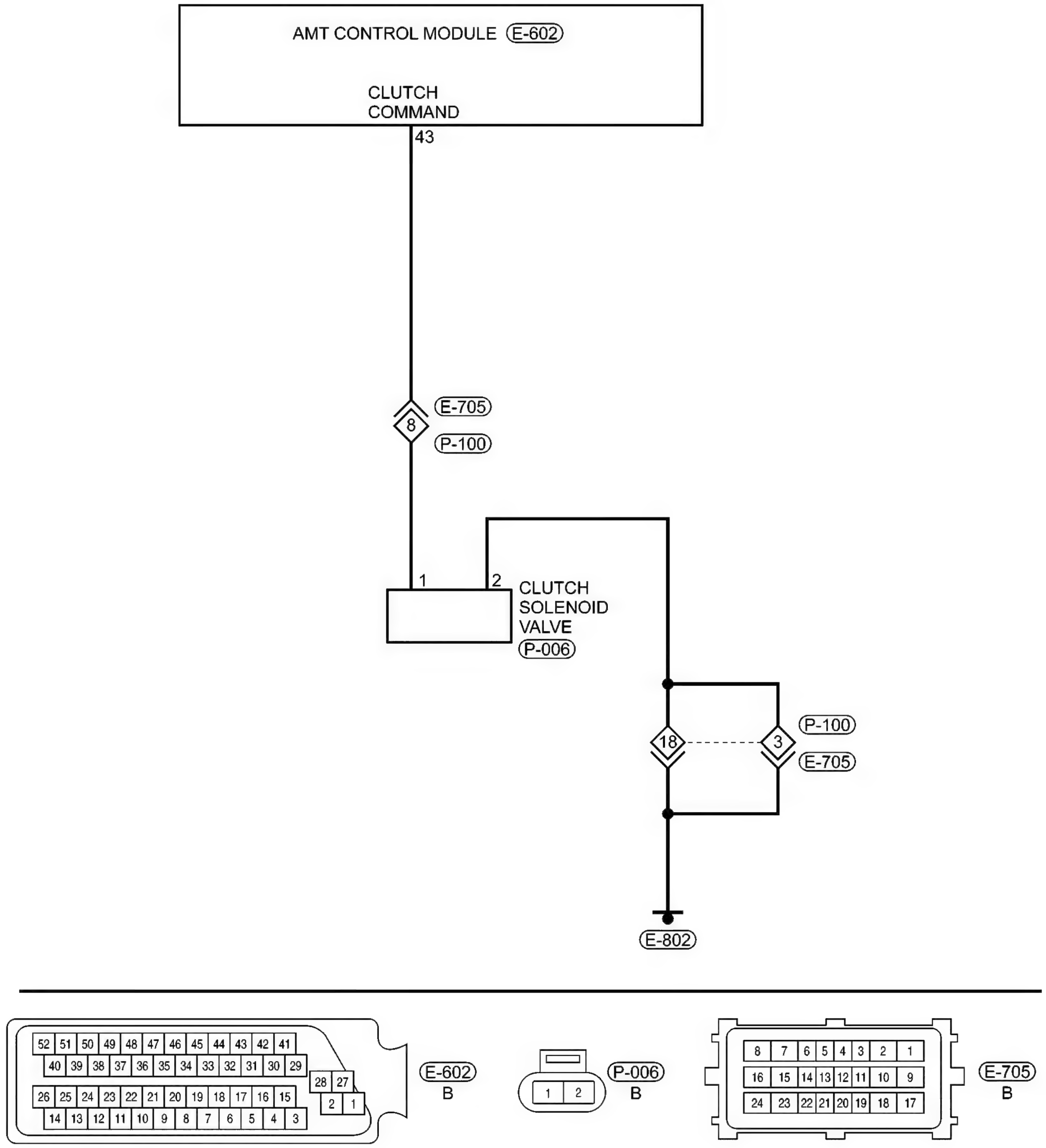
- With the X-431 scan tool, read AMT control module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC P0932 still present?

Yes >> Replace the AMT control module (See AMT Control Module Removal & Installation in Section 08 Transaxle).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

P2904 - Clutch Error


AMT CONTROL MODULE E-602
CLUTCH COMMAND
43
8
E-705
P-100
1
2
CLUTCH SOLENOID VALVE
P-006
18
3
P-100
E-705
E-802
E-602
B
P-006
B
E-705
B

pzsmw080010t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC Detection Condition	DTC Set Condition	POSSIBLE CAUSES
P2904	Clutch error	Vehicle is driving	• The Automated Manual Transaxle (AMT) control module will set this DTC when the AMT control module detected the clutch not opening before it tries to operate the clutch solenoid valve. • AMT control module will set this DTC when it detected the clutch closing during the AMT engagement. • If this DTC is set, the AMT can only be shifted up to 3rd gear forcibly.	• Clutch position sensor • Clutch solenoid valve • Harness or connectors (The sensor circuit is open or shorted) • AMT control module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- After connection, press POWER key to start X-431.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the Automated Manual Transaxle (AMT) control module.
- Start engine and warm it to normal operating temperature.
- Drive the vehicle in 1st, 2nd, 3rd, 4th and 5th gears.
- With the scan tool, select view DTC and data stream.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 08 Transaxle for more information).

NOTE :

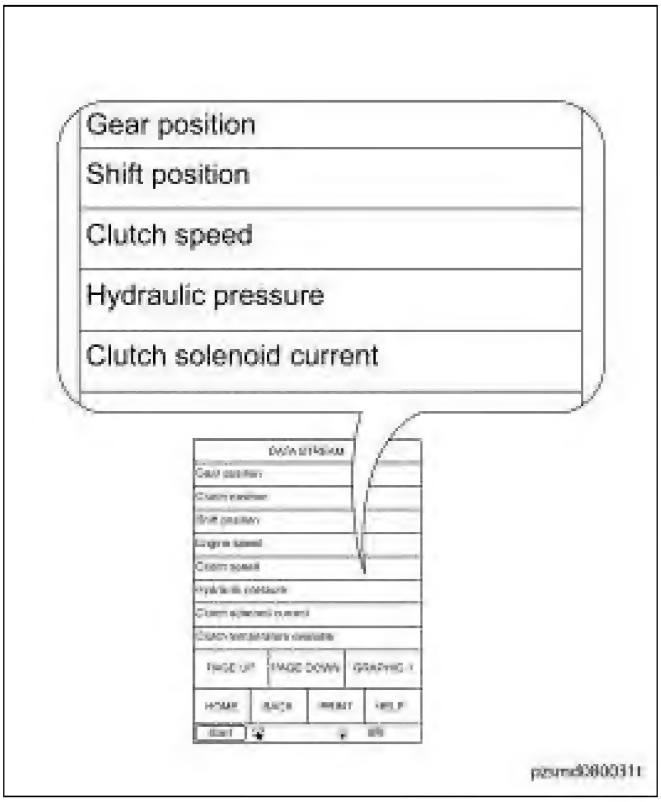
- If DTC P0805 is present, diagnose and repair it before continuing with this test.
- Using the appropriate diagnostic test tool, you can diagnose the AMT control module harness while the AMT control module is still connected. This will help prevent electrical connector terminal damage.

Diagnostic Procedure

1. CHECK CLUTCH SOLENOID SIGNAL

- With the scan tool, select view DTC and data stream for AMT.
- Start the engine.
- Monitor the value of the clutch solenoid as indicated in the following table while driving:

X-431 Reference Value


Gear position
Shift position
Clutch speed
Hydraulic pressure
Clutch solenoid current
PAGE UP
PAGE DOWN
GRAPHIC
HOME
BACK
PRINT
HELP
pzumd0800311

ITEM	CONDITION	CURRENT VALUE
Clutch	Vehicle is driving	OK

Is the check result normal?

Yes >> The conditions that caused this DTC to set are not present at this time (See Diagnostic Help in Section 08 Transaxle).

No >> Go to the next step.

2. ACTUATE TEST

- With the X-431, perform the solenoid actuate test.
- The solenoid should be heard.

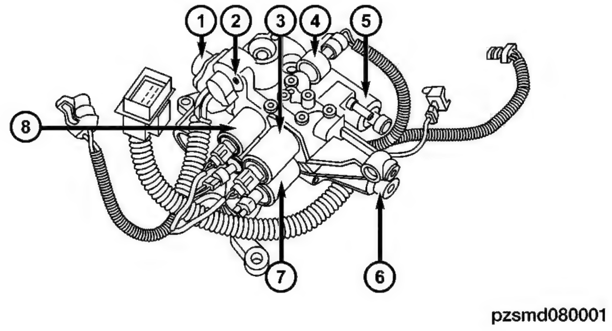
Is the check result normal?

Yes >> Go to step 8.

No >> Go to the next step.

3. CHECK CLUTCH SOLENOID VALVE ELECTRICAL CONNECTOR

- Stop the vehicle and turn ignition switch off.
- Disconnect the clutch solenoid valve electrical connector P-006 (3).
- Inspect the electrical connector for damage.

NUMBER	SOLENOID/SENSOR	
1	Gear position sensor	
2	Shift position sensor	
3	Clutch solenoid valve	
4	Hydraulic pressure sensor	
5	Gear solenoid valve	
6	Clutch position sensor	
7	Gear solenoid valve	
8	Shift solenoid valve	

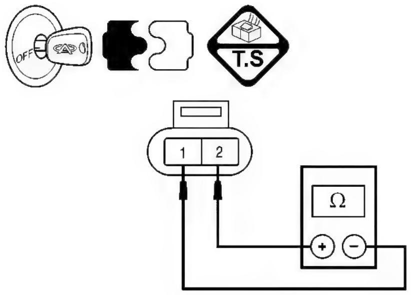
Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

4. CHECK CLUTCH SOLENOID VALVE RESISTANCE

- Check the clutch solenoid resistance as shown in the following table:

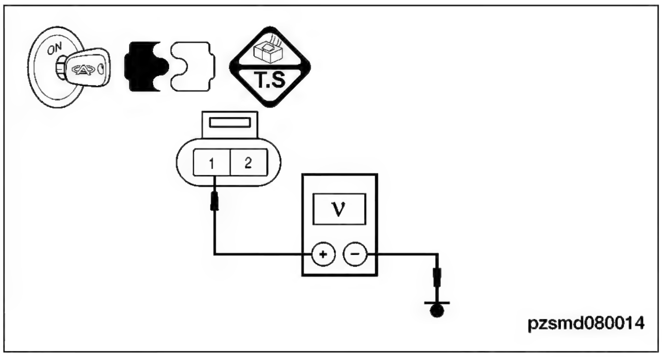
AMT CLUTCH SOLENOID TERMINAL	CLUTCH SOLENOID VALVE TERMINAL	VALUE	
Resistance (23°C)	1 & 2	Standard value (Ω)	

Is the check result normal?

Yes >> Replace the clutch solenoid valve with a known good solenoid.
With the X-431, perform the solenoid actuate test.
– If the solenoid can be heard, the system is normal.
– If the solenoid can't be heard, go to the next step.

No >> Replace the clutch solenoid valve.

5. CHECK CLUTCH SOLENOID VALVE POWER SUPPLY



- Turn ignition switch on.
- Operate the scan tool X-431 to actuate the clutch solenoid valve.
- Check for voltage between terminal 1 of the clutch solenoid valve connector P-006 and ground, terminal side.
- Voltage should be more than 12 V.

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.

6. DETECT MALFUNCTIONING PART

- Check the following:
  - Harness connectors E-705 and P-100, terminal 8
  - Harness open or short between AMT connector and clutch solenoid valve connector

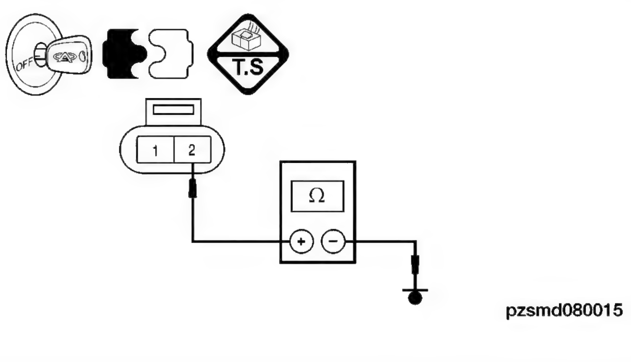
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to power or short to ground.

7. CHECK CLUTCH SOLENOID VALVE GROUND CIRCUIT

- Turn ignition switch off.
- Disconnect the AMT control module electrical connector.
- Check for harness continuity between the following terminals:

AMT CONTROL MODULE TERMINAL	TERMINAL	CONTINUITY	
2	Ground	Yes	

- Check the harness for a short to power.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to power or short to ground.

8. CHECK DTC

- With the X-431 scan tool, read AMT control module DTCs.
- Refer to "DTC Confirmation Procedure".

Is the check result normal?

Yes >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

No >> Replace the AMT control module (See AMT control module Removal & Installation in Section 08 Transaxle).

ON-VEHICLE SERVICE

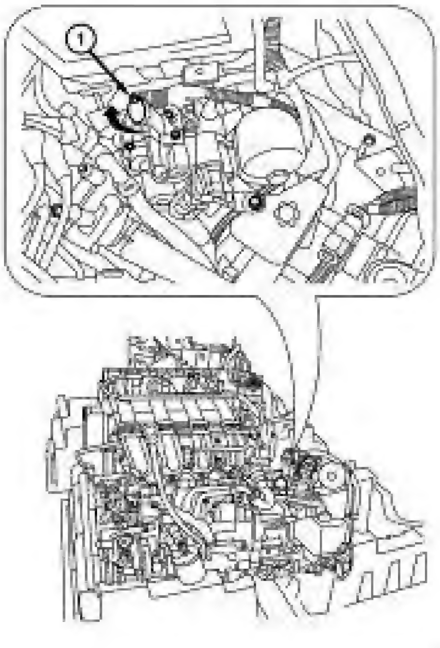
Automated Manual Transaxle (AMT) Electro-Mechanical Control Unit

Removal & Installation

WARNING!

Before removing the automated manual transaxle electro-mechanical control unit, the internal system pressure must be relieved to 0 bar with the X-431 scan tool.

1. Disconnect the negative battery cable.
2. Disconnect the following electrical connectors:
    - Clutch Solenoid Valve
    - Shift Gear Solenoid Valve
    - Selector Gear Solenoid Valve
    - Gear Position Sensor
    - Shift Position Sensor
    - Hydraulic Pressure Sensor
    - Clutch Position Sensor
    - Crankshaft Position Sensor
3. Loosen the transaxle control shaft cover retaining bolt (1) and rotate the cover.
4. Rotate the shaft a quarter turns by using a screwdriver.



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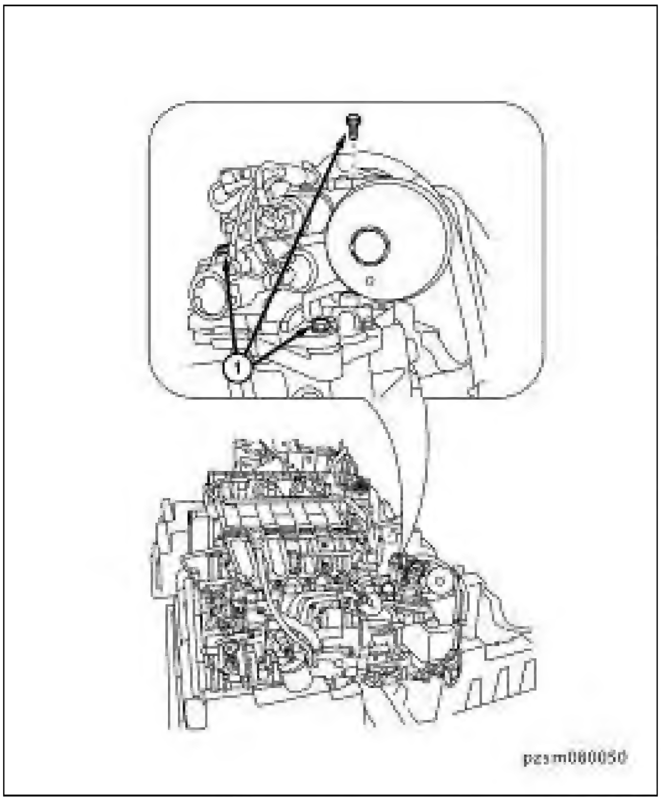
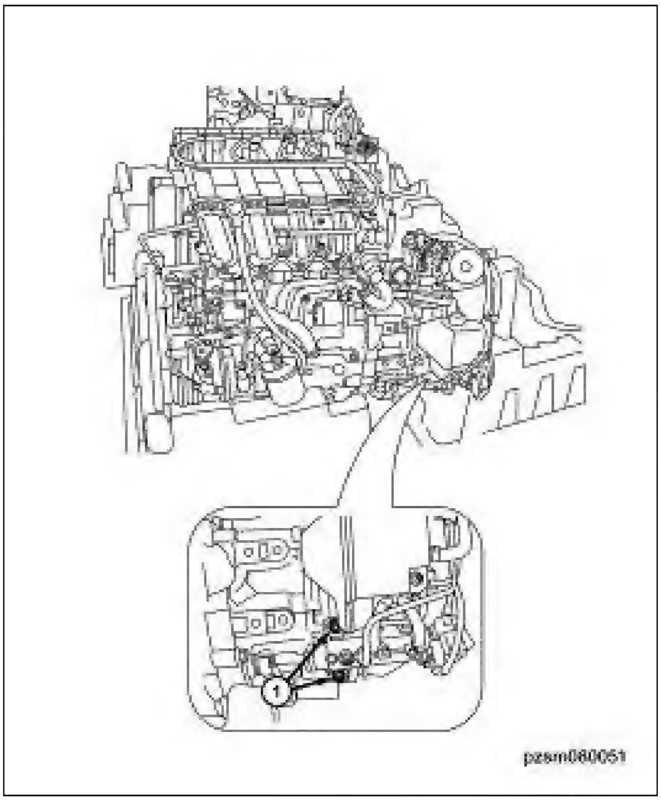
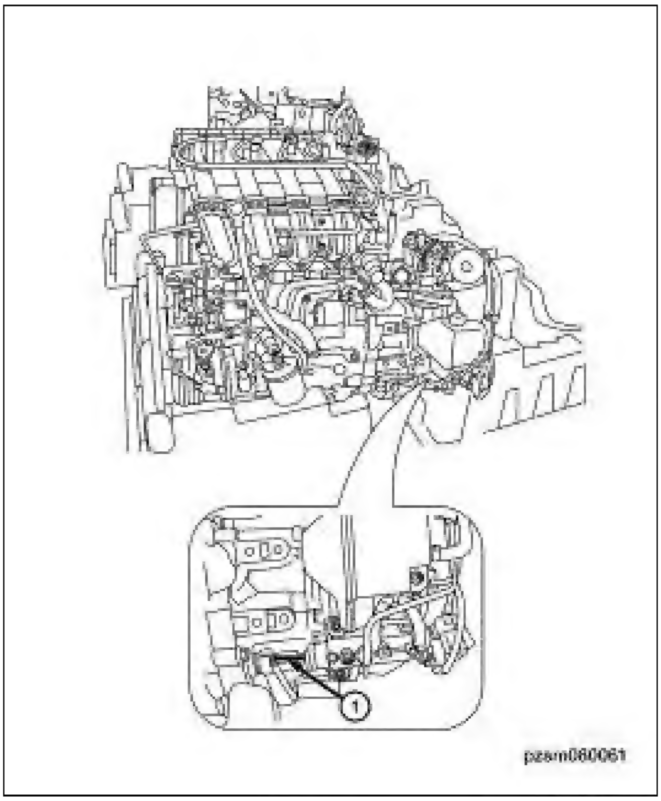
5. Remove the three control shaft cover retaining bolts (1).
   (Tighten: Control shaft cover retaining bolts to 44 ± 2 N·m)



6. Remove the two clutch control actuator retaining bolts (1).
   (Tighten: Clutch control actuator retaining bolts to 24 ± 2 N·m)



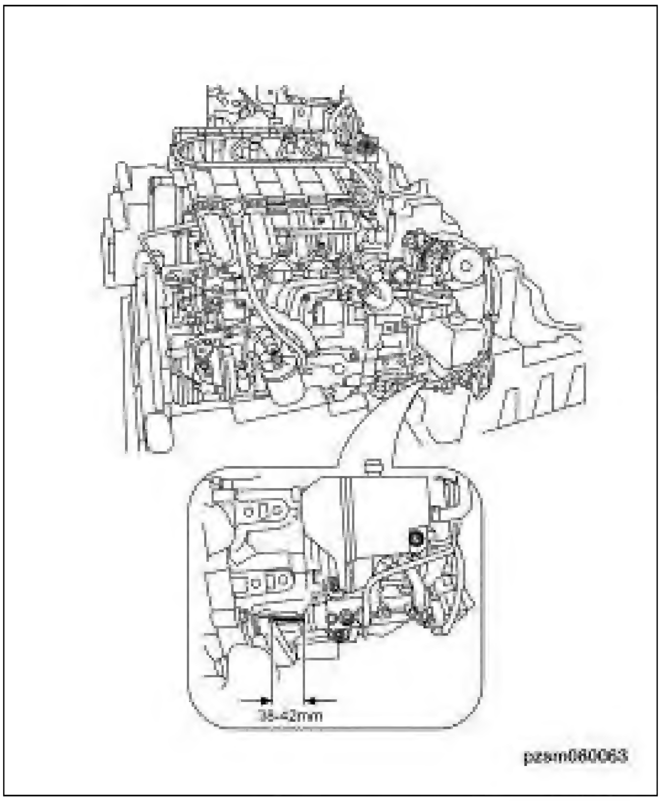
7. Release the clutch cable (1) from the release shaft arm.



8. Remove the AMT valve and hydraulic actuator assembly.

Installation Notes:

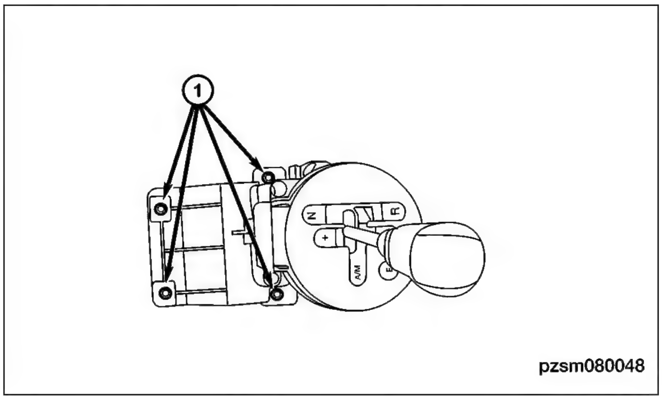
- During assembly, ensure that the clutch cable is installed in a loose state, with the distance between clutch cable control actuator to clutch control arm at 38 mm - 42 mm.



Automated Manual Transaxle (AMT) Gearshift Mechanism

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the lower console (See Lower Console Removal & Installation in Section 15 Body & Accessories).
3. Disconnect the gearshift mechanism electrical connector.
4. Remove the four gearshift mechanism retaining bolts (1).
   (Tighten: Gearshift mechanism retaining bolts to 10 ± 2 N·m)

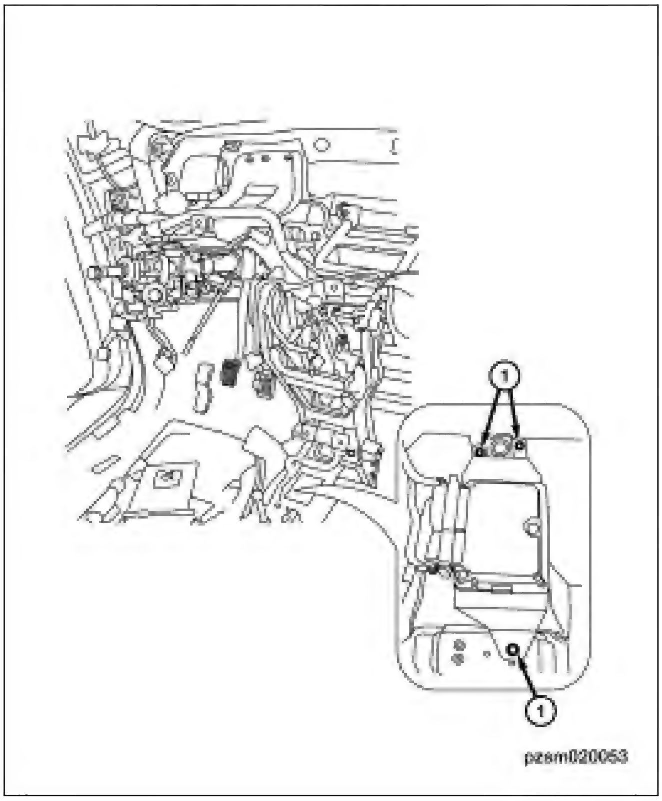


5. Remove the gearshift mechanism from the bracket.

Automated Manual Transaxle (AMT) Control Module

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the lower console (See Lower Console Removal & Installation in Section 15 Body & Accessories).
3. Disconnect the three AMT control module electrical connectors.
4. Remove the AMT control module retaining bolts (1).
   (Tighten: AMT control module retaining bolts to 10 ± 2 N·m)



5. Remove the AMT control module.

DRIVELINE & AXLE

09

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FRONT AXLE

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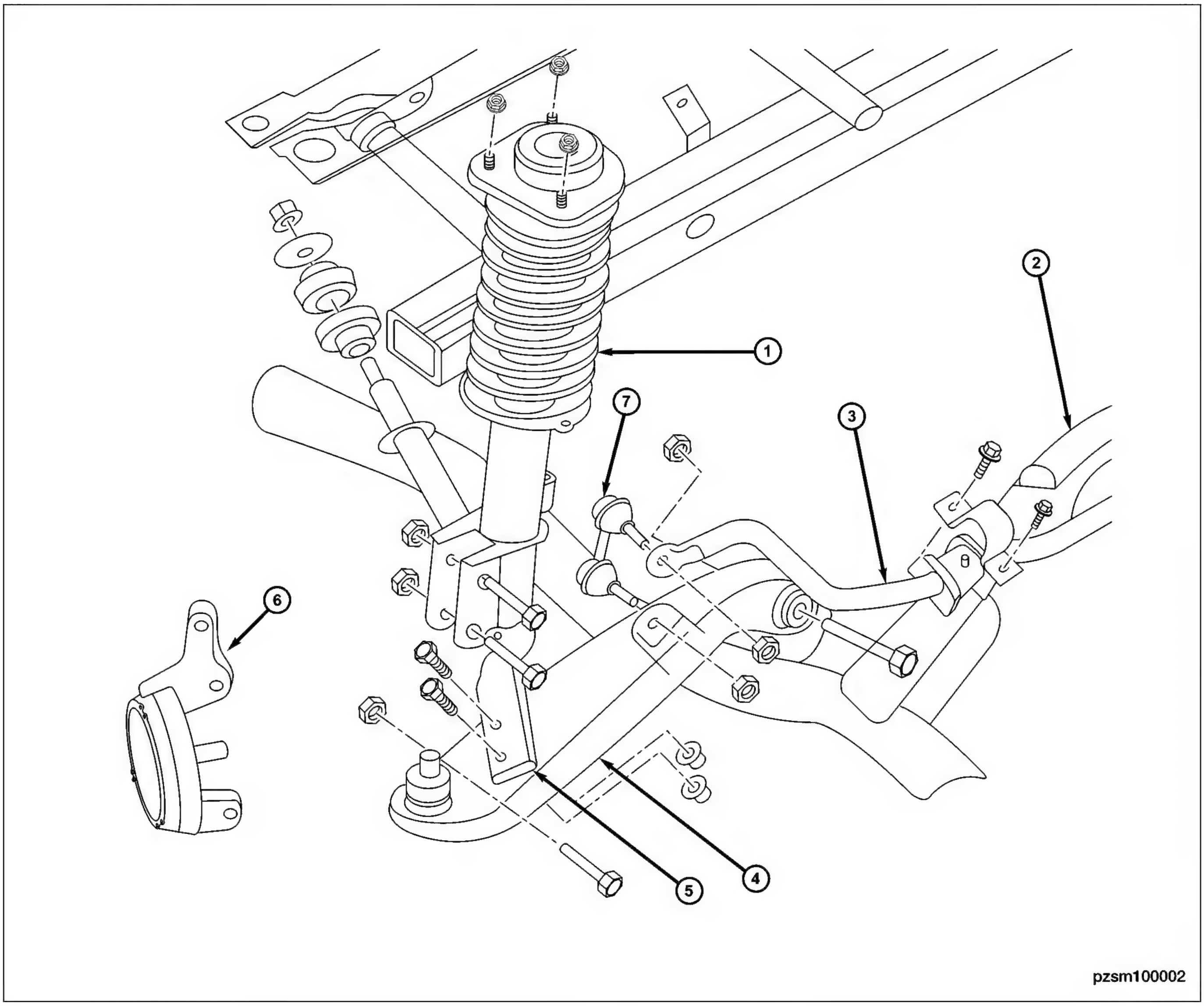
GENERAL INFORMATION

Description



1 - Front Strut Assembly	5 - Front Strut Rod
2 - Front Sub-Frame	6 - Front Steering Knuckle
3 - Front Stabilizer Bar	7 - Front Stabilizer Bar Link
4 - Front Lower Control Arm	

This vehicle is equipped with an unequal length half shaft system consisting of short left and long right half shafts. The half shafts consist of a fixed Constant Velocity (CV) joint at the outboard end connected by a solid shaft to a plunging CV joint on the inboard end. The inner CV joint has a splined end and is attached to the transaxle and is retained with a snap ring. The outer joint has a splined connection to the wheel hub and is retained with a lock nut.

For further information on the front axle assembly see Front Sub-Frame Assembly Description & Operation in Section 10 Suspension.

Operation

The front axle transmits torque from the transaxle to the wheels. In order to allow vertical and horizontal movement of the wheels, the axle shafts have plunging CV joints on the inboard ends of the axle shafts.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Axle Shaft Hub Nut	135
Brake Caliper Adapter To Steering Knuckle Bolts	110
Brake Caliper To Adapter Bolts	40
Dust Shield Bolts	10
Hub And Bearing Mounting Bolts	65
Outer Tie Rod End To Steering Knuckle Nut	35
Lower Strut Mounting Nut	110
Wheel Mounting Nuts	110

DIAGNOSIS & TESTING

Vehicle Inspection

Inspect the following for leaks or damage:
- Check for grease in the vicinity of the inboard tripod joint and outboard CV joint.
- Check the inner or outer joint seal boot or seal boot clamp for damage.

Noise Or Vibration On Turns

A clicking noise or a vibration in turns could be caused by one of the following conditions:
- Damaged outer CV joint or damaged CV seal boot or seal boot clamps.
- Damaged inner CV joint or damaged CV seal boot or seal boot clamps.
- Noise may also be caused by another component of the vehicle coming in contact with the half shafts.

NOTE :
If the CV seal boot is damaged, this will result in the loss and/or contamination of the joint grease, resulting in inadequate lubrication of the joint.

Clunking Noise During Acceleration

This noise may be a result of one of the following conditions:
- A torn seal boot on the inner or outer joint of the half shaft assembly.
- A loose or missing clamp on the inner or outer joint of the half shaft assembly.
- A damaged or worn half shaft CV joint.

Shudder Or Vibration During Acceleration

This problem could be a result of:
- A worn or damaged half shaft inner tripod joint.
- Improper wheel alignment.

Vibration At High Speeds

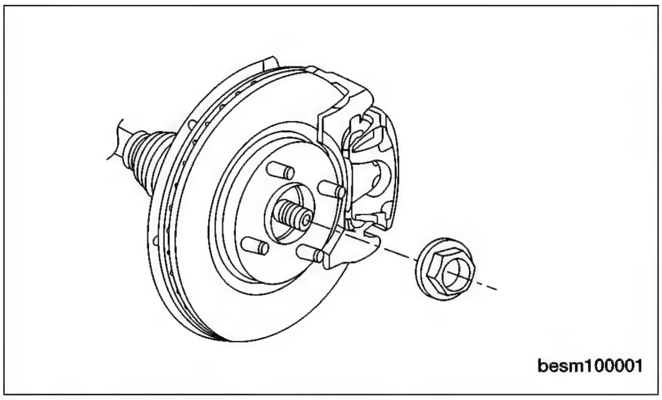
This problem could be a result of:
- Foreign material (mud, etc.) packed on the backside of the wheel(s).
- Out of balance tires or wheels.
- Improper tire or wheel runout.

ON-VEHICLE SERVICE

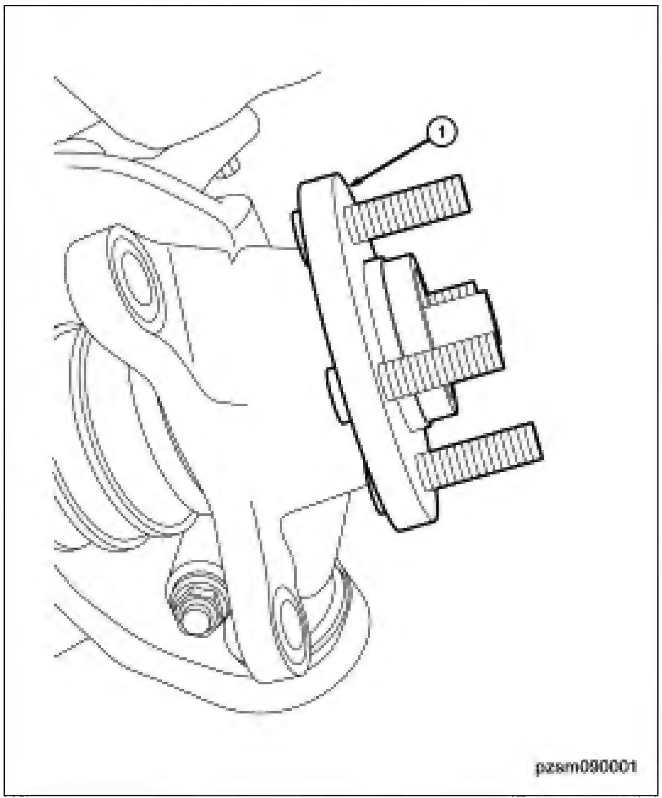
Front Hub and Bearing

Removal & Installation

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly. (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the front axle hub nut from the front knuckle. (Tighten: Front axle hub nut to 135 N·m)



4. Remove the front brake rotor (See Brake Rotor Removal & Installation in Section 12 Brakes).
5. Using a bearing puller, remove the hub (1) and bearing from the front knuckle.



6. Installation is in the reverse order of the removal.

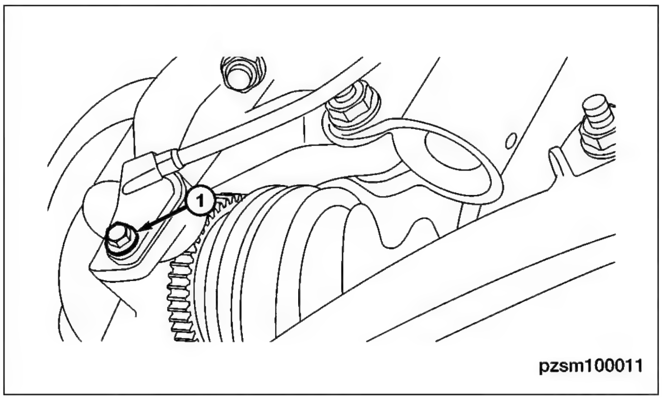
Front Axle Shaft

Removal & Installation

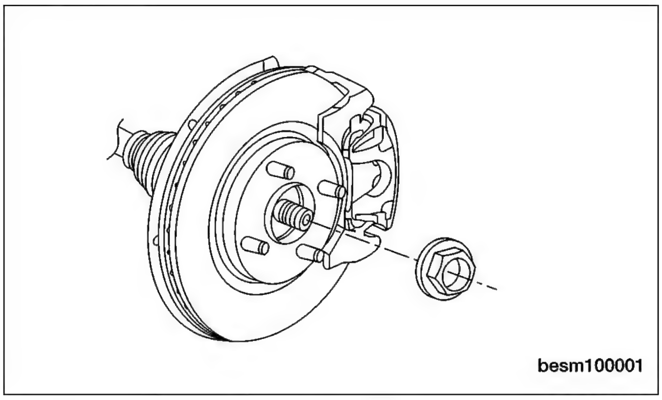
NOTE :
The following special tools are required to perform the repair procedure:

- CH-10002 - Ball Joint Separator

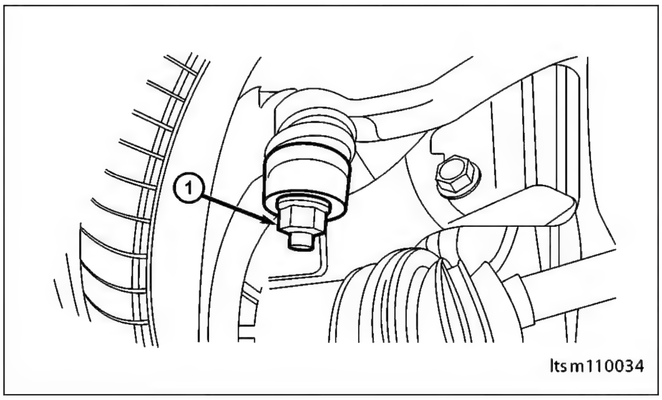
1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the front wheel speed sensor retaining bolt (1) and set the wheel speed sensor aside.
   (Tighten: Wheel speed sensor bolt to 15 ± 2 N·m)



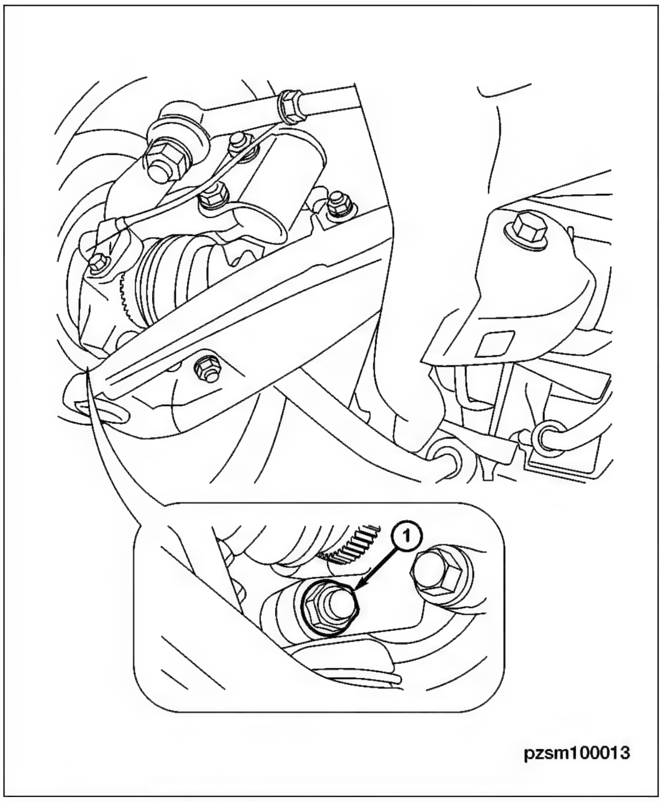
4. Remove the axle shaft hub nut from the front knuckle.
   (Tighten: Axle shaft hub nut to 135 N·m)



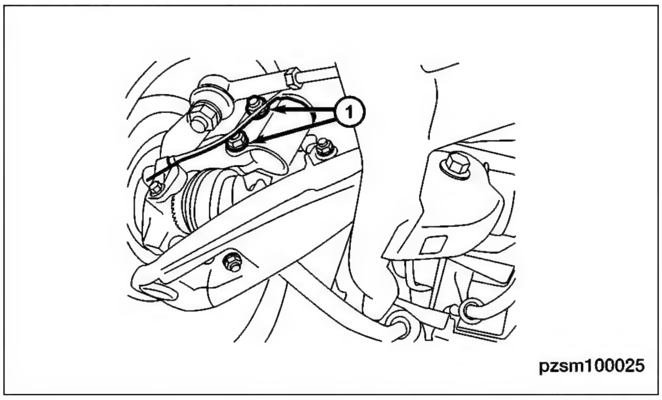
5. Remove the front brake caliper (See Front Brake Caliper Removal & Installation in Section 12 Brake).
6. Remove the nut (1) attaching the outer tie rod end to the steering knuckle.
   (Tighten: Outer tie rod end nut to 40 ± 5 N·m)
7. Using special tool CH-10002, separate the tie rod from the steering knuckle.



8. Remove the pinch bolt (1) from the steering knuckle.
   (Tighten: Steering knuckle pinch bolt to 110 ± 10 N·m)



9. Using special tool CH-10002, separate the ball joint from the steering knuckle.
10. Remove the strut to the steering knuckle bolts (1).
    (Tighten: Strut to steering knuckle bolts to 110 ± 10 N·m)



11. Remove the outer axle shaft from the steering knuckle.
    CAUTION: When removing the front axle shaft, do not subject the constant velocity joint to an excessive angle. Also, be careful not to excessively extend the slide joint.
12. Remove the outer axle shaft from the steering knuckle.
13. Remove the inner axle shaft from the transaxle.
14. Remove the front axle shaft from the vehicle.
15. Installation is in the reverse order of removal.

Installation Notes:

- Move joint up/down, left/right, and in axial direction, check for any rough movement or significant looseness.
- Check boot for cracks or other damage, and for grease leakage.
- If damaged, disassemble axle shaft to verify damage, and repair or replace as necessary.

REAR AXLE

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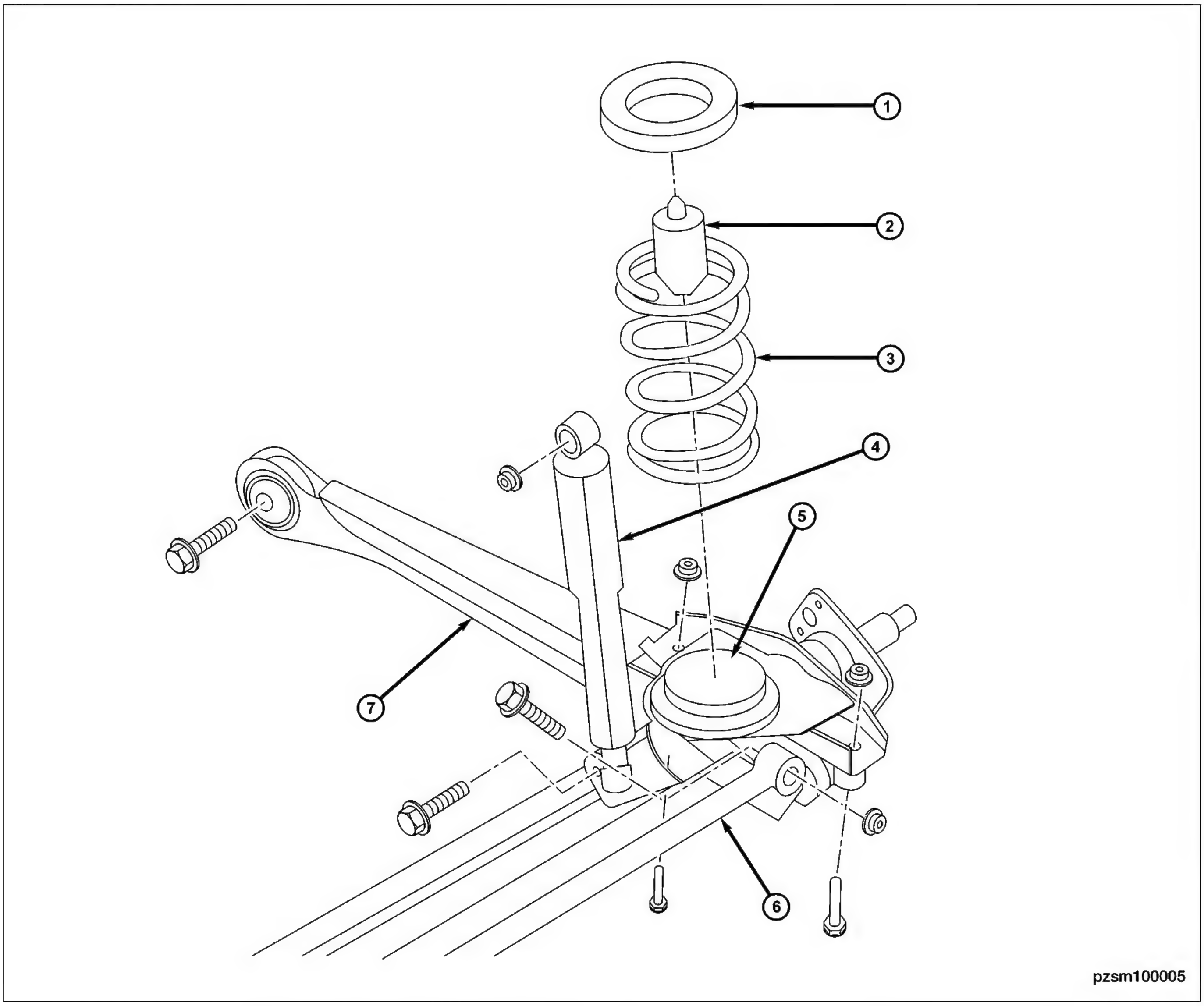
GENERAL INFORMATION

Description



1 - Rear Spring Cushion	5 - Rear Axle Assembly
2 - Rear Bumper Block	6 - Cross Stay Assembly
3 - Rear Coil Spring	7 - Trailing Arm
4 - Rear Strut Assembly	

The rear axle utilizes an independent design. This suspension system incorporates a separate wheel knuckle for each wheel and allows the wheels to react to road imperfections independent of each other. This independent action offers improved isolation from the effects of jounce and rebound.

The rear axle consists of the following components:
- Wheel hub
- Wheel studs
- Wheel bearing
- Knuckle

For further information on the rear axle assembly see Rear Suspension Description & Operation in Section 10 Suspension.

Operation

The rear axle utilizes a sealed wheel bearing housed in the rear knuckle assembly.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Rear Axle Hub Nut	135
Wheel Mounting Nuts	110

DIAGNOSIS & TESTING

Vehicle Inspection

Inspect the rear axle for the following:

- Check the rear axle for loose bearings.
- Check the rear axle hub for any damage or excessive runout.
- Check the rear bearing for runout.
- Check for any noise from the rear bearing while driving the vehicle.

Vibration At High Speeds

This problem could be a result of:

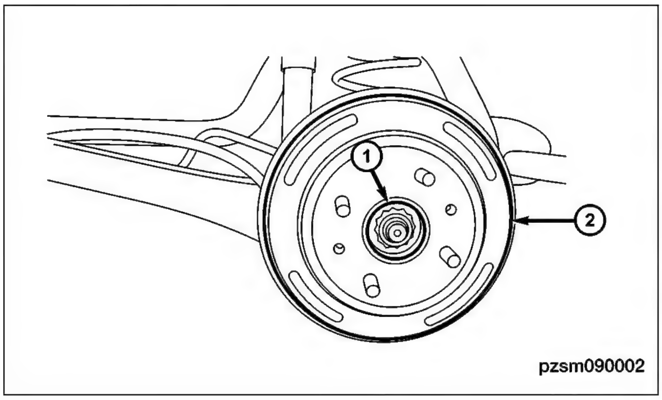
- Foreign material (mud, etc.) packed on the backside of the wheel(s).
- Out of balance tires or wheels.
- Improper tire or wheel runout.

ON-VEHICLE SERVICE

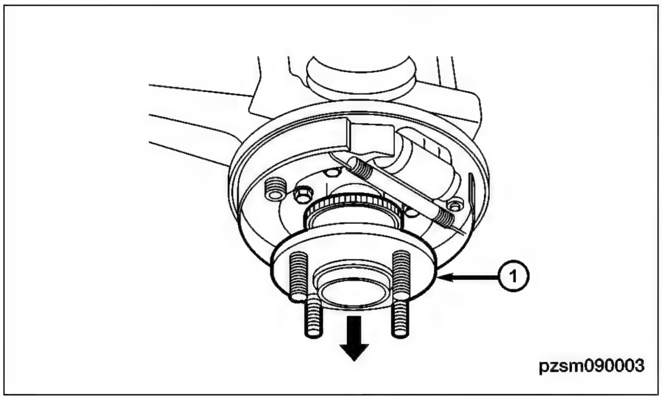
Rear Hub and Bearing

Removal & Installation

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the rear axle hub nut cover.
4. Remove the rear axle hub nut (1).
   (Tighten: Rear axle hub nut to 135 N·m)
5. Remove the rear brake drum (2).



6. Remove the rear hub and bearing (1).
7. Installation is in the reverse order of removal.



SUSPENSION
10

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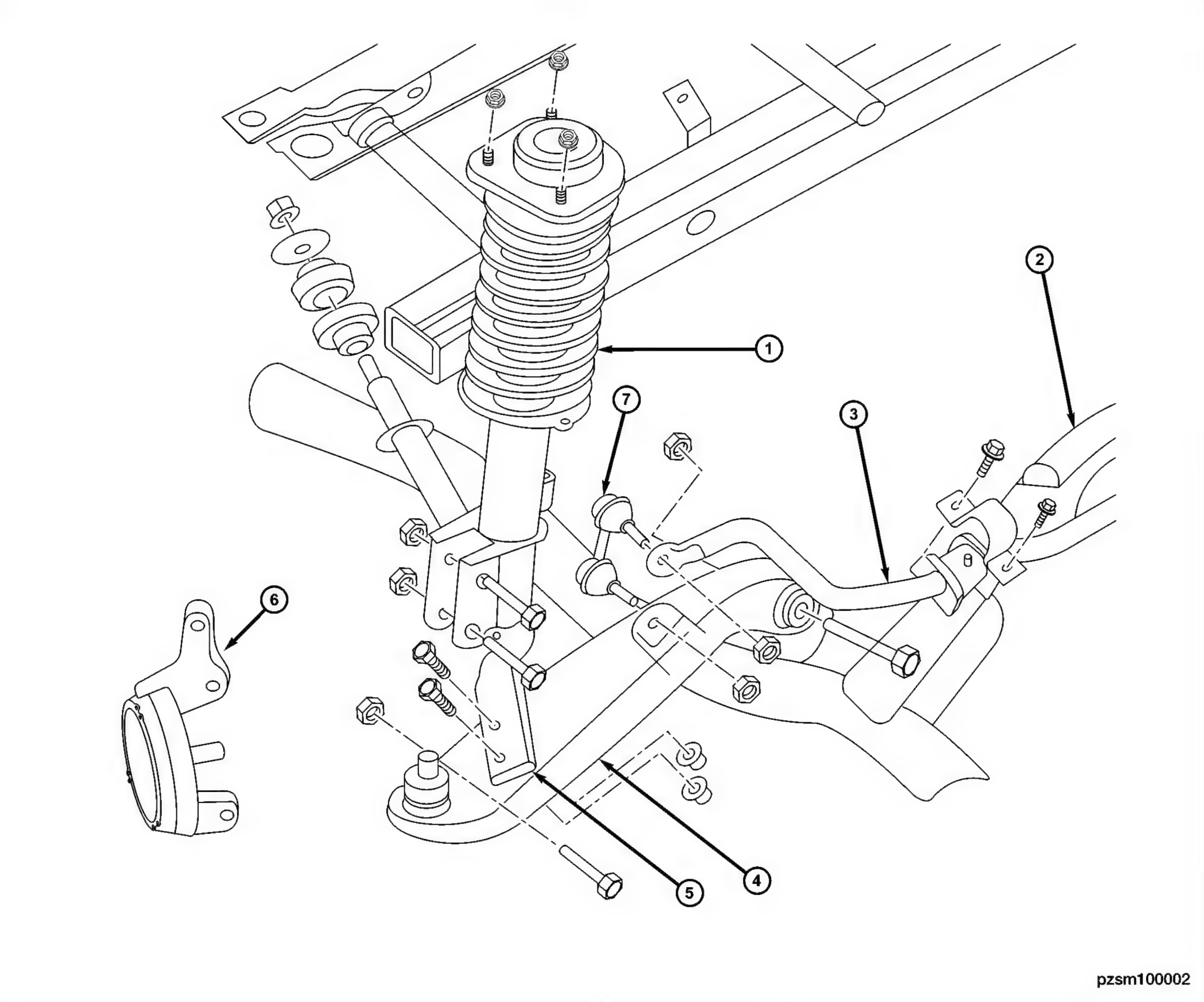
GENERAL INFORMATION

Description

The suspension system incorporates a strut assembly that takes the place of the upper control arm and upper ball joint. The strut carries out the function of a shock absorber and is encompassed by a coil spring. The strut assembly supports the weight of the vehicle and is also the pivot point for the steering knuckle. This system uses a lower control arm and ball joint for the lower pivot point of the steering knuckle.



1 - Front Strut Assembly	5 - Front Strut Rod
2 - Front Sub-Frame	6 - Front Steering Knuckle
3 - Front Stabilizer Bar	7 - Front Stabilizer Bar Link
4 - Front Lower Control Arm	

WARNING!
Do not remove the strut rod nut while the strut assembly is installed in the vehicle, or before the coil spring is compressed with a spring compressor. The spring is held under high pressure and must be compressed before the strut rod nut can be removed.

CAUTION:
At no time when servicing a vehicle can a sheet metal screw, bolt, or other metal fastener be installed in the shock tower to replace the original plastic clip. It may come in contact with the strut or coil spring.

CAUTION:
The wheel bearing will be damaged if the vehicle is rolled with the axle shaft hub nut loose.

Operation

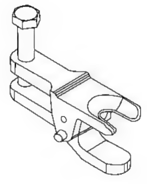
The front suspension utilizes a MacPherson strut system. This suspension system incorporates a strut assembly that takes the place of the upper arm and ball joint. The strut performs the function of a shock absorber and is encompassed by a coil spring.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Axle Shaft Hub Nut	270 ± 20
Dust Shield Bolt	3 ± 0.5
Inner Tie Rod Adjustment Jam Nut	35 ± 3
Stabilizer Bar Link To Stabilizer Bar Nut	100 ± 10
Lower Control Arm Ball Joint Pinch Bolt	110 ± 10
Lower Control Arm To Front Sub-Frame Bolt	150 ± 10
Lower Control Arm To Stabilizer Bar Link Nut	110 ± 10
Outer Tie Rod End To Steering Knuckle Nut	40 ± 5
Strut Rod To Lower Control Arm Bolt	75 ± 5
Strut Rod To Sub-Frame Nut	105 ± 10
Stabilizer Bar Clamp Bolts	50 ± 5
Stabilizer Bar Link Nuts	110 ± 10
Strut-To-Tower Nuts	60 ± 5
Sub-Frame Mounting Bolts	150 ± 10
Strut To Steering Knuckle Bolts	110 ± 10
Wheel Mounting Nuts	110

Special Tools

Ball Joint Separator CH-10002	 besm020086

DIAGNOSIS & TESTING

Vehicle Suspension Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Front End Whine On Turns	· Defective wheel bearing. · Incorrect wheel alignment. · Low power steering fluid level.	· Replace wheel bearing. · Check and reset wheel alignment. · Fill power steering fluid reservoir to proper level and check for leaks (make sure all air is bled from the system).
Road Wander	· Incorrect tire pressure. · Incorrect front or rear wheel toe-in. · Worn wheel bearings. · Worn control arm bushings. · Excessive friction in strut upper bearing.	· Inflate tires to recommended pressure. · Correct front or rear wheel toe-in. · Replace wheel bearing. · Replace control arm. · Replace strut bearing.
Lateral Pull	· Unequal tire pressure. · Incorrect front wheel camber. · Wheel braking. · Excessive cross-caster.	· Inflate all tires to recommended pressure. · Check and reset front wheel camber. · Correct braking condition causing lateral pull. · Check wheel alignment and adjust if necessary.

ON-VEHICLE SERVICE

Front Steering Knuckle

Description

The steering knuckle is a single casting with legs machined for attachment to the front strut assembly on the top and steering linkage on the side. The steering knuckle also has two machined, drilled legs on the end casting to support and align the front disc brake caliper adapter.

Operation

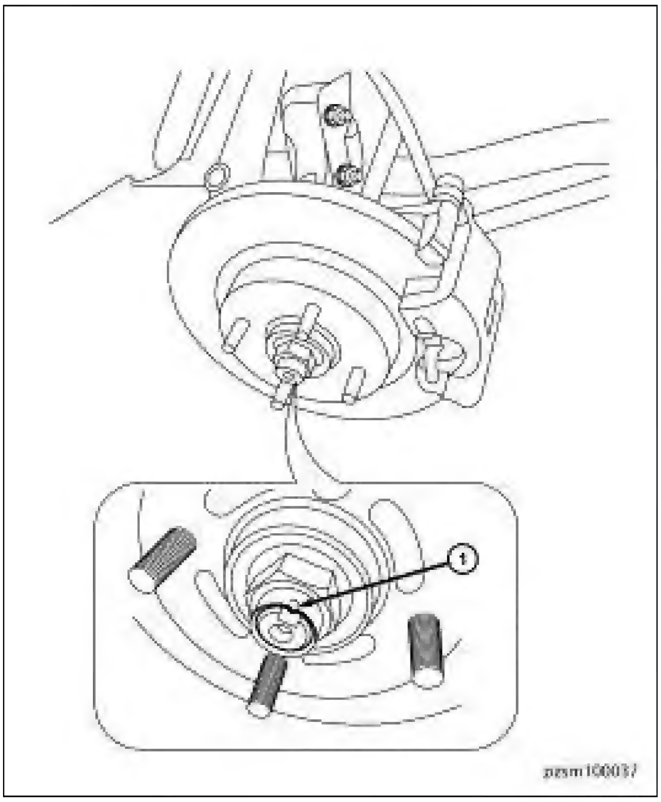
The steering knuckle supports the hub and bearing. The front suspension steering knuckle is not a repairable component of the front suspension. It must be replaced if damaged in anyway. If it is determined that the steering knuckle is bent when servicing the vehicle, no attempt should be made to straighten the steering knuckle.

Removal & Installation

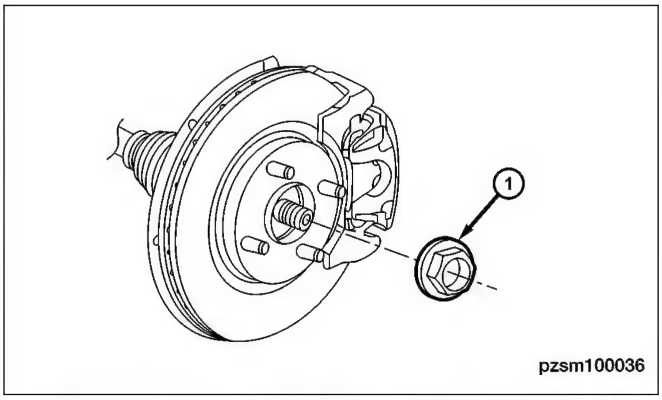
NOTE :
The following special tools are required to perform the repair procedure:

- CH-10002 - Ball Joint Separator

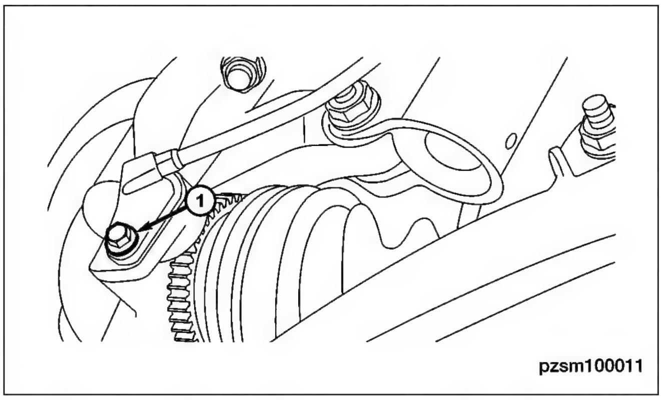
1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly. (Tighten: Wheel mounting nuts to 110 N·m)
3. Use a suitable tool and un-stake the front axle shaft hub nut (1) from the groove in the front axle shaft.



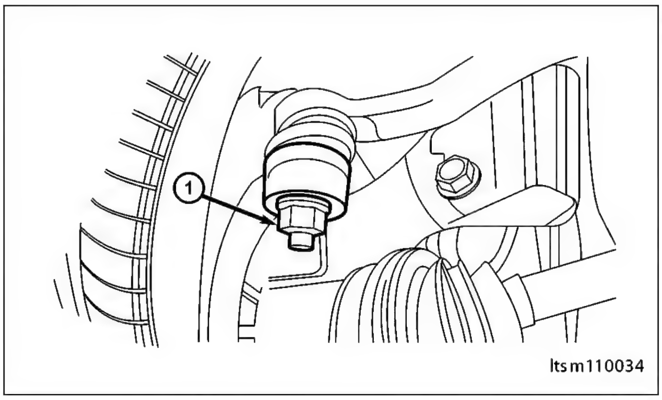
4. While a helper applies the brakes to keep the hub from rotating, remove the front axle shaft hub nut (1).
   (Tighten: Axle shaft hub nut to 270 ± 20 N·m)



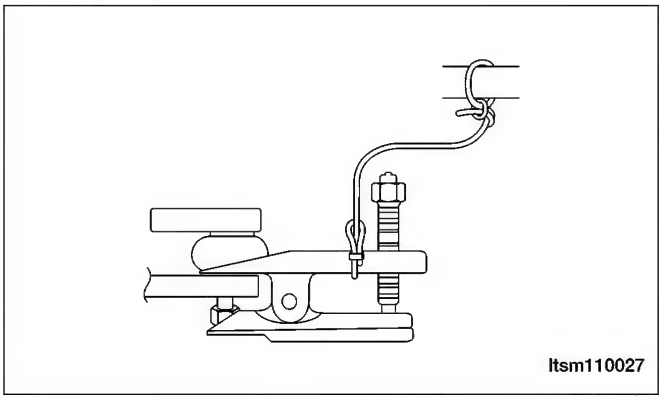
5. Access and remove the Front Brake Rotor (See Front Brake Rotor Remove & Installation in Section 12 Brakes).
6. Remove the wheel speed sensor retaining bolt (1) and set the wheel speed sensor aside.
   (Tighten: Wheel speed sensor bolt to 15 ± 2 N·m)



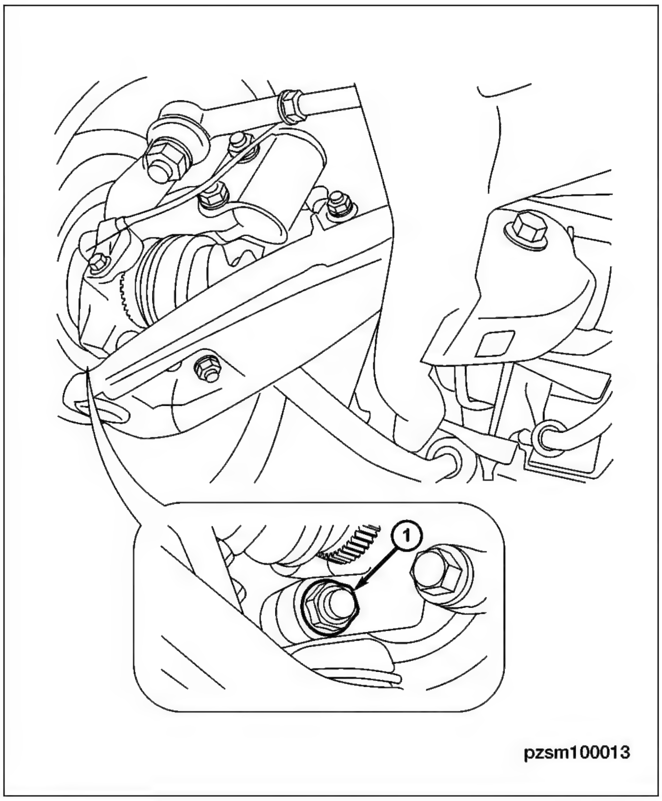
7. Remove the nut (1) attaching the outer tie rod end to the steering knuckle.
   (Tighten: Outer tie rod end to the steering knuckle nut to 40 ± 5 N·m)



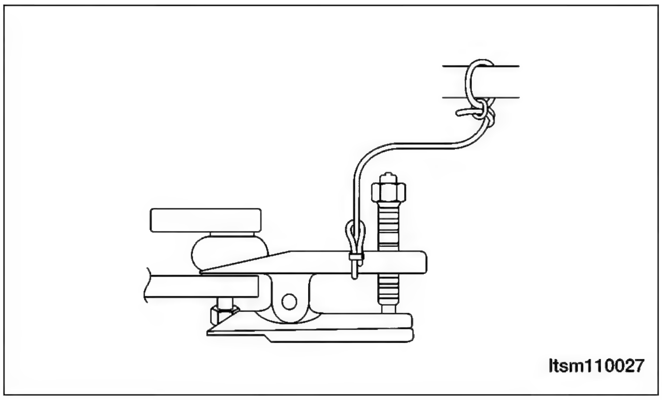
8. Using special tool CH-10002, separate the outer tie rod end from the steering knuckle.



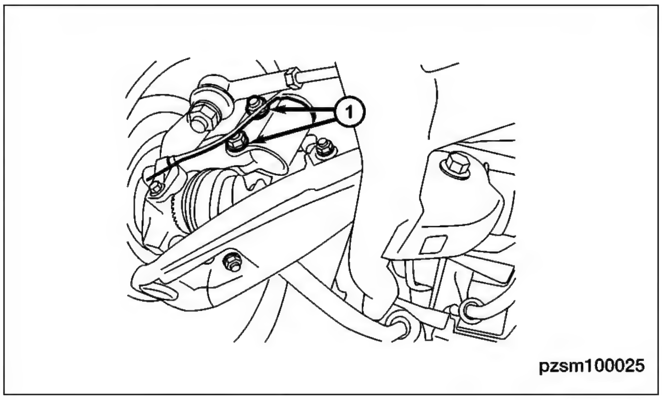
9. Remove the lower ball joint mounting nut (1) attaching the lower control arm to the knuckle.
   (Tighten: Steering knuckle pinch bolt to 110 ± 10 N·m)



10. Using special tool CH-10002, separate the ball joint from the steering knuckle.



11. While holding the bolt heads stationary, remove the two nuts (1) from the bolts attaching the strut assembly to the steering knuckle.
    (Tighten: Strut to steering knuckle bolts to 110 ± 10 N·m)



12. Pull the steering knuckle off the half shaft outer C/V joint splines and remove the steering knuckle from the vehicle.

NOTE :
Do not allow the half shaft to hang by the inner C/V joint. It must be supported to keep the joint from separating during this operation.

13. Remove the screws fastening the shield to the steering knuckle. Remove the shield.
14. Slide the hub and bearing out of the steering knuckle.
15. Installation is in the reverse order of removal.

Installation Notes:

- After installing the front steering knuckle, perform a front end alignment (See Front Wheel Alignment in Section 10 Suspension).

Front Lower Control Arm

Description

The lower control arm is located between the steering knuckle and the vehicle sub-frame. The lower control arm uses a lower ball joint on the outer end and two sub-frame mounts on the inner end.

Operation

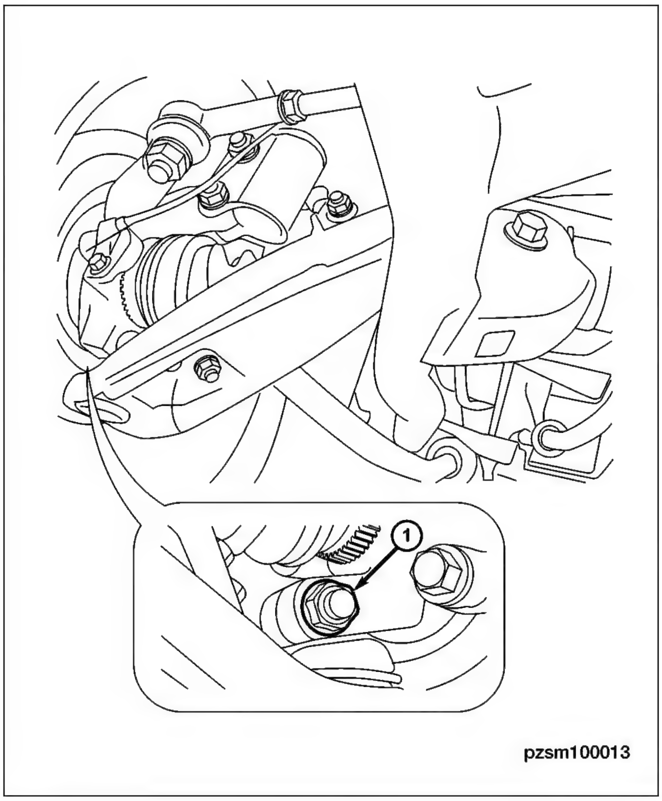
The front lower control arm supports the steering knuckle. The lower control arm controls the vehicle steering by maintaining the proper wheel alignment through all driving conditions.

Removal & Installation

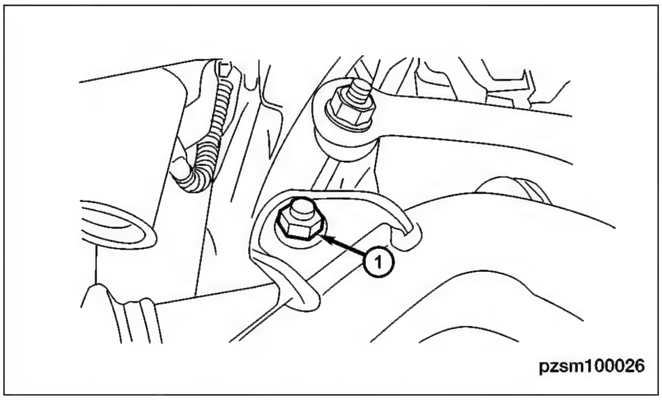
NOTE :
Inspect the lower control arm for signs of damage from contact with the ground or road debris. If the lower control arm shows any sign of damage, look for distortion. Do not attempt to repair or straighten a broken or bent lower control arm. If damaged, the lower control arm is serviced only as a complete component.

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)

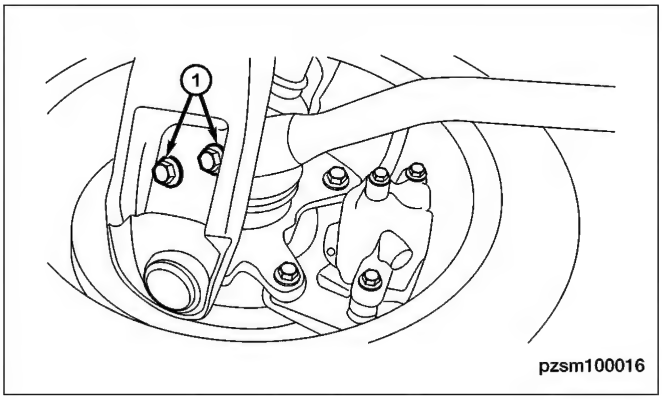
3. Remove the lower ball joint nut (1) from the steering knuckle, then separate the lower control arm ball joint from the steering knuckle.
   (Tighten: Steering knuckle pinch bolt to 110 ± 10 N·m)



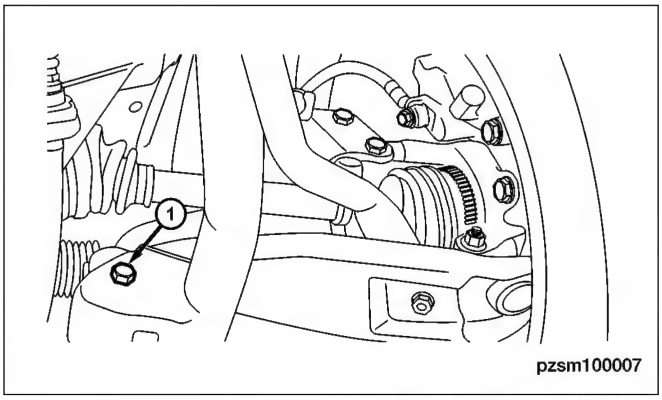
4. Remove the lower control arm to the stabilizer bar link nut (1).
   (Tighten: Lower control arm to the stabilizer bar link nut to 110 ± 10 N·m)



5. Remove the two lower control arm to the strut rod bolts (1).
   (Tighten: Lower control arm to the strut rod bolt to 75 ± 5 N·m)



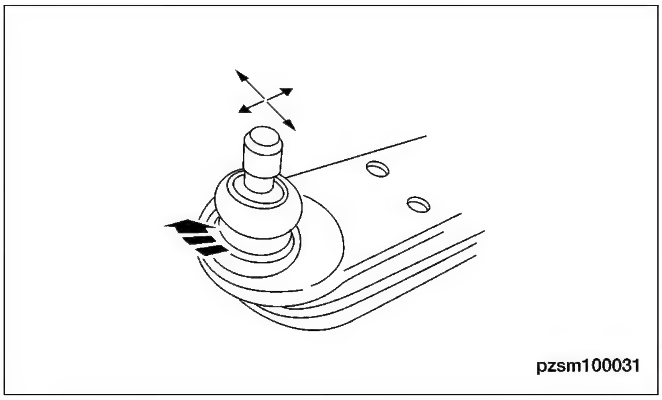
6. Remove the lower control arm to the sub-frame bolt (1).
   (Tighten: Lower control arm to the sub-frame bolt to 150 ± 10 N·m)



7. Remove the lower control arm from the sub-frame.
8. Perform the following inspection procedure before installation.

Inspection

Lower control arm inspection:
   a. Check for smooth rotation.
   b. Inspect ball stud for damage.
   c. Inspect dust cover for damage or oil leak.
   d. Inspect for play in the ball joint, if defective, replace the ball joint.



9. Install the lower control arm is in the reverse order of removal.

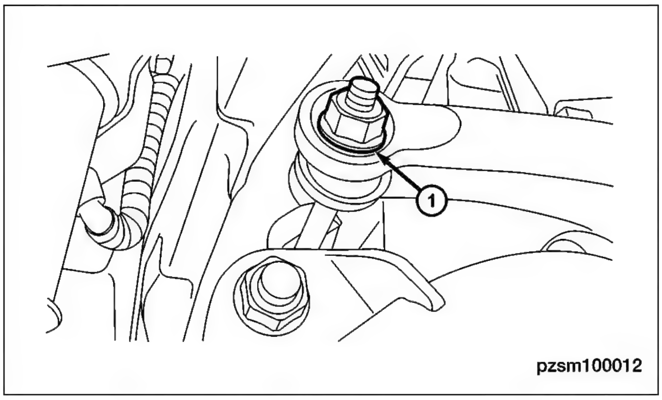
Installation Notes:

After installation, each bolt must be tightened to the required tightening torque.

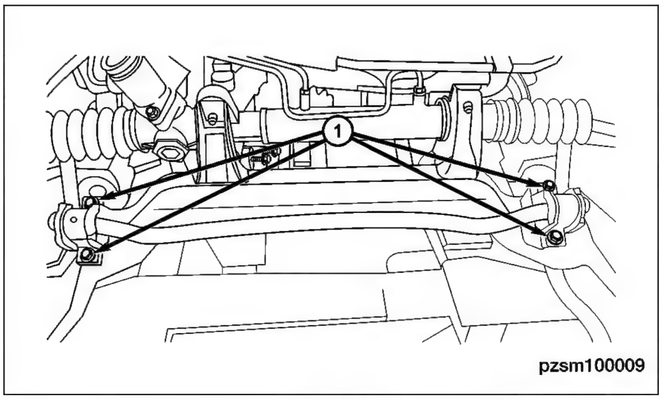
Front Stabilizer Bar

Removal & Installation

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the stabilizer bar link nuts (1) attaching the stabilizer bar to the stabilizer bar link.
   (Tighten: Stabilizer bar link nuts to 110 ± 10 N·m)



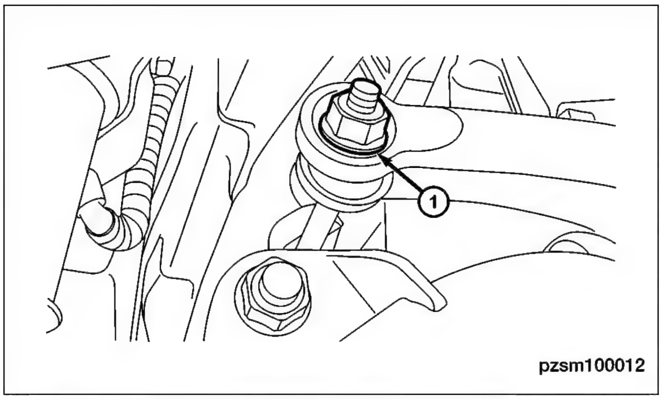
4. Remove the bolts (1) securing the stabilizer bar bushing retainers to the sub-frame.
   (Tighten: Stabilizer bar bushing retainer bolts to 50 ± 5 N·m)
5. Remove the two stabilizer bar bushing retainers.
6. Remove the stabilizer bar from the vehicle.
7. Installation is in the reverse order of removal.



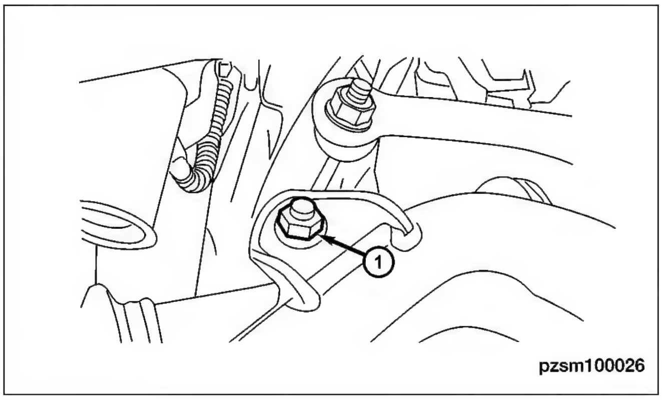
Front Stabilizer Bar Link

Removal & Installation

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the stabilizer bar link nuts (1) attaching the stabilizer bar to stabilizer bar link.
   (Tighten: Stabilizer bar link nuts to 110 ± 10 N·m)



4. Remove the lower control arm to the stabilizer bar link nut (1).
   (Tighten: Lower control arm to the stabilizer bar link nut to 110 ± 10 N·m)



5. Installation is in the reverse order of removal.

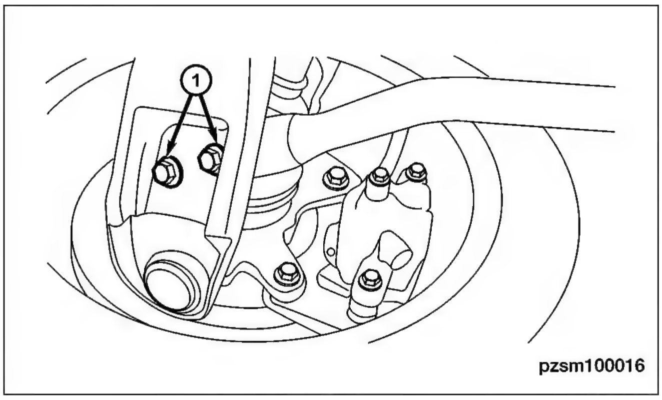
Installation Notes:

- After installation, each bolt must be tightened to the required tightening torque.

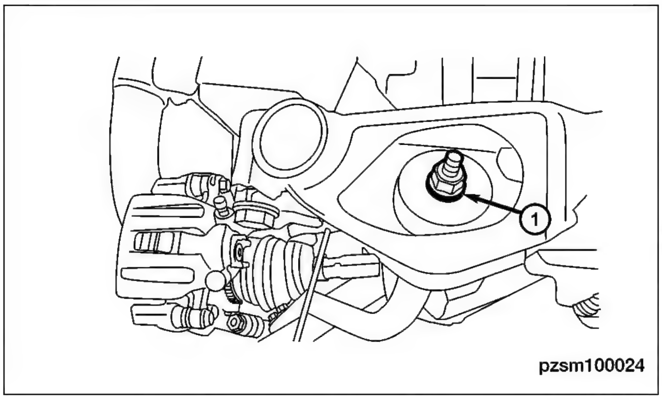
Front Strut Rod

Removal & Installation

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the two strut rod bolts (1) attaching the strut rod to lower control arm.
   (Tighten: Strut rod bolts to 75 ± 5 N·m)



4. Remove the strut rod nut (1) attaching the strut rod to sub-frame.
   (Tighten: Strut rod nut to 105 ± 5 N·m)

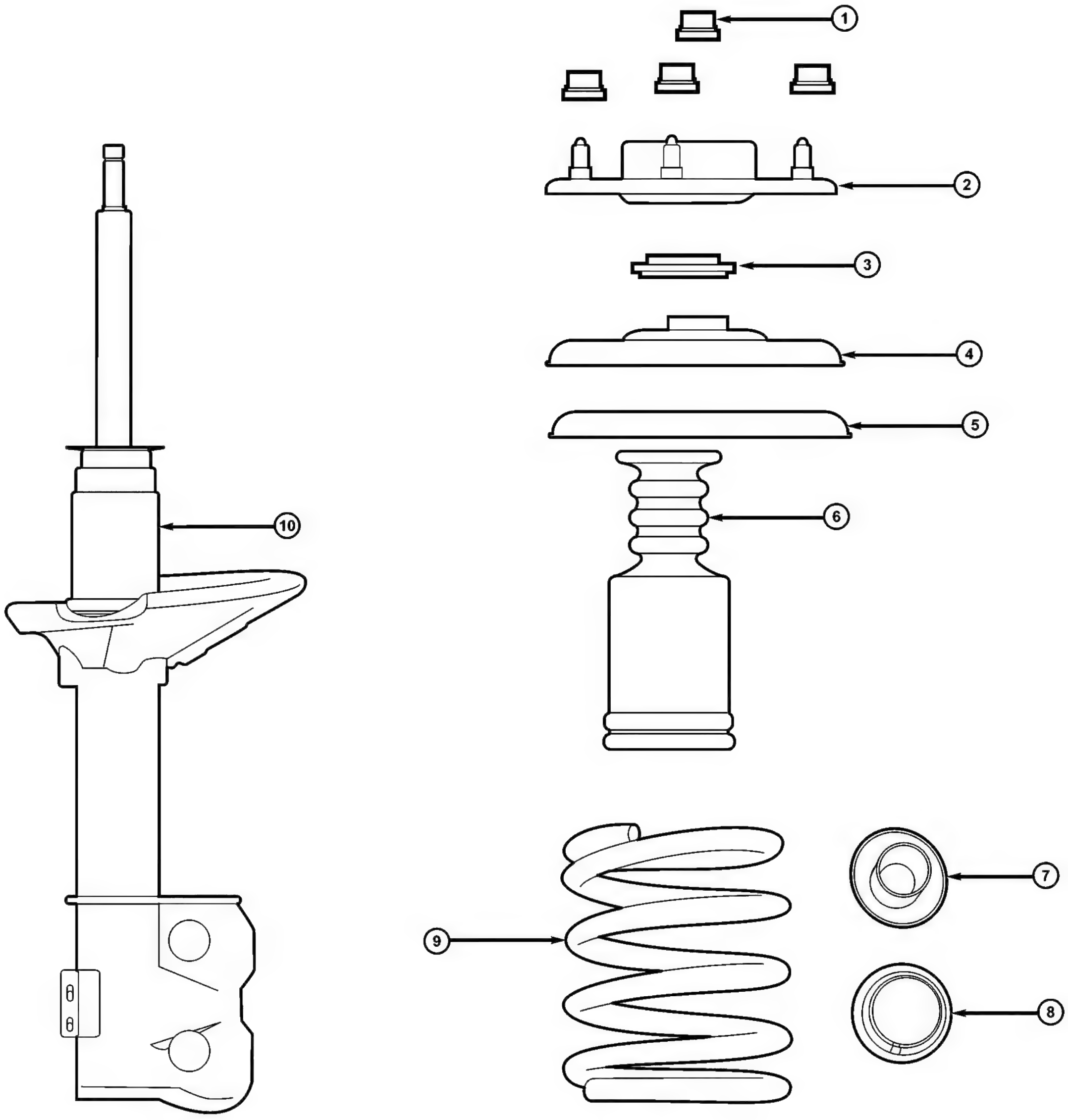


5. Remove the strut rod.
6. Installation is in the reverse order of removal.

Front Strut Assembly

Description

A MacPherson type design strut assembly is used in place of the traditional front suspension upper control arm and upper ball joint. The bottom of the strut mounts directly to the steering knuckle using two attaching bolts and nuts going through the strut clevis bracket and steering knuckle. The top of the strut mounts directly to the strut tower of the vehicle using the three threaded studs on the strut assembly’s upper mount.



1 - Mounting Nut	6 - Cushion Pad
2 - Upper Mount	7 - Plastic Cover
3 - Pivot Bearing	8 - Cushion
4 - Bearing and Upper Spring Seat	9 - Coil Spring
5 - Upper Spring Isolator	10 - Strut

Operation

The strut assembly cushions the ride of the vehicle, controlling vibration, jounce and rebound of the suspension. The coil spring controls ride quality and maintains proper ride height. The spring isolators isolate the coil spring at the top and bottom from coming into metal-to-metal contact with the upper mounting seat and the strut. The strut dampens jounce and rebound motions of the coil spring and suspension.

Diagnosis & Testing

Before removing the front strut, perform the following to test the front strut functionality:

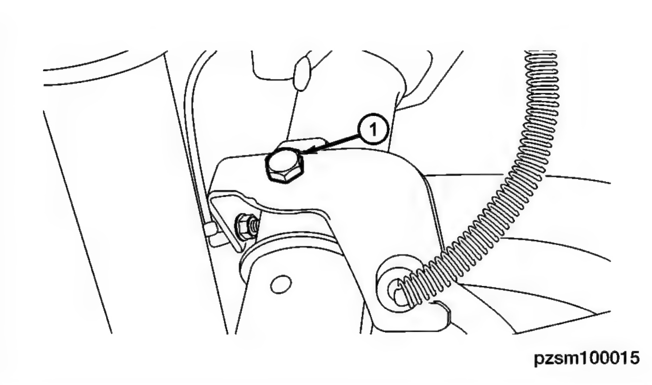
- Adjust the tire pressure in all tires to proper specifications.
- Push and shake the front of the vehicle three or four times with identical force every time.
- During the pushing and recoiling, the resistance and recoil times of the vehicle should be equal.
- If the strut (shock absorber) functions properly, the vehicle will recoil several times and then stop recoiling after the pushing force is removed.

Removal & Installation

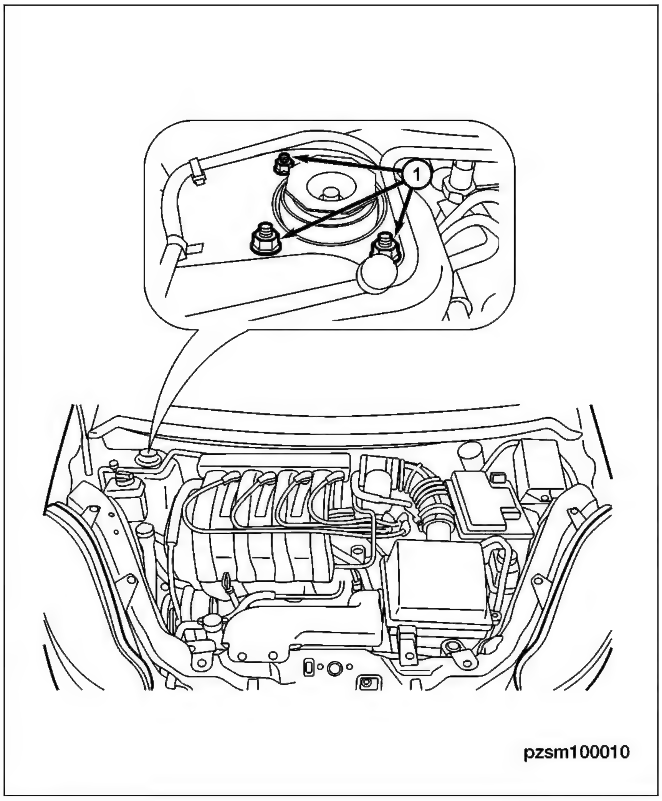
CAUTION:

At no time when servicing a vehicle can a sheet metal screw, bolt or other metal fastener be installed into the strut tower to take the place of an original plastic clip. Also, do not drill holes in the front strut tower for the installation of any metal fasteners.

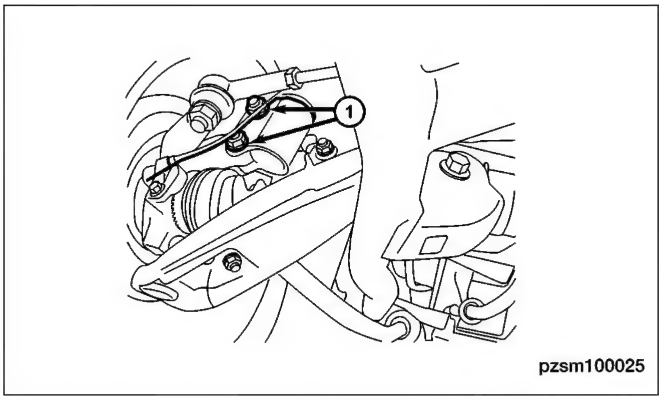
1. Open the engine hood.
2. Raise and support the vehicle.
3. Remove the wheel mounting nuts and the wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)
4. Remove the brake fluid hose bracket retaining bolt (1).
   (Tighten: Brake oil hose bracket bolt to 10 ± 2 N·m)



5. Remove the strut-to-tower nuts (1) attaching the strut assembly upper mount to the strut tower. (Tighten: Strut-to-tower nuts to 60 ± 5 N·m)



6. Remove the strut to the steering knuckle bolts (1). (Tighten: Strut to steering knuckle bolts to 110 ± 10 N·m)



7. Remove the strut assembly from the vehicle.
8. Installation is in the reverse order of removal.

Front Coil Spring

Description

A coil-over front strut assembly supports each front coil spring. The top of the strut assembly mounts to the strut tower.

Operation

Coil springs are designed to store energy and subsequently release it and to absorb shock and maintain a force between contacting surfaces. Coil springs are rated for specific vehicle applications.

NOTE :
Each component is serviced by removing the strut assembly from the vehicle and disassembling it. Coil springs are rated separately for each corner or side of the vehicle depending on optional equipment and type of vehicle service. If a coil spring requires replacement, be sure that it is replaced with a spring meeting the correct load rating for the vehicle and its specific options.

Removal & Installation

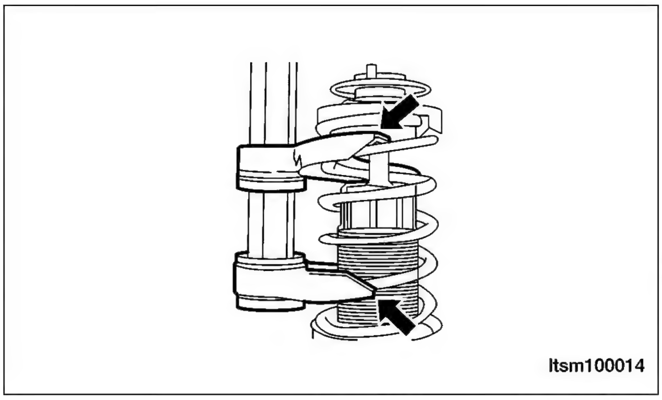
CAUTION:
At no time when servicing a vehicle can a sheet metal screw, bolt or other metal fastener be installed into the strut tower to take the place of an original plastic clip. Also, do not drill holes into the front strut tower for the installation of any metal fasteners into the strut tower area indicated.

1. Remove the front strut assembly (See Front Strut Removal & Installation in Section 10 Suspension).

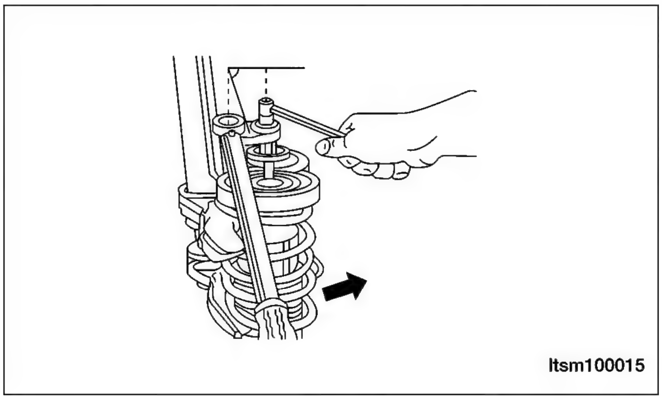
WARNING!

Do not remove the strut rod nut before the coil spring is properly compressed. The coil spring is held under pressure. The coil spring must be compressed, removing spring tension from the upper mount and bearing, before the strut rod nut is removed.

2. Position the strut assembly in the strut coil spring compressor following the manufacturer's instructions and set the lower and upper hooks of the compressor on the coil spring.
3. Compress the coil spring until all coil spring tension is removed from the upper mount and bearing.



4. Once the spring is sufficiently compressed, install the strut nut wrench on the strut rod nut.
5. Install a deep socket on the end of the strut rod.
6. While holding the strut rod, remove the nut using the strut nut wrench.
   (Tighten: Strut rod nut to 110 ± 10 N·m)



7. Remove the lower spring isolator from the strut seat.
8. Remove the dust shield and jounce bumper.
9. Remove the upper mounting bracket.
10. Remove the upper spring seat and isolator.
11. Release the tension from the coil spring by backing off the compressor drive completely. Release the compressor hooks and remove the coil spring.

12. Assembly is in the reverse order of disassembly.

Sub-Frame Assembly

Removal & Installation

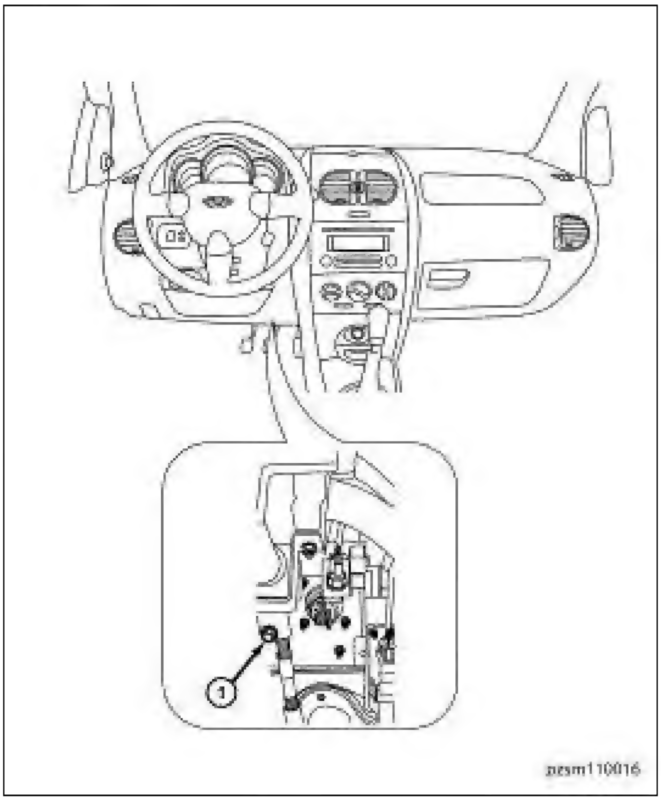
NOTE :
The following special tools are required to perform the repair procedure:

- CH-10002 - Ball Joint Separator

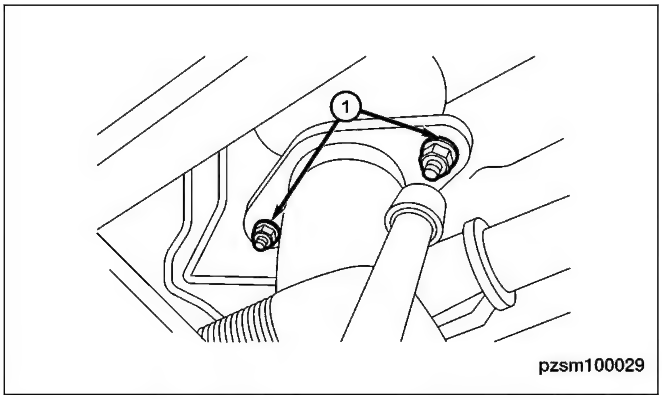
WARNING!

Before removing the sub-frame assembly, properly support the engine and transaxle assembly.

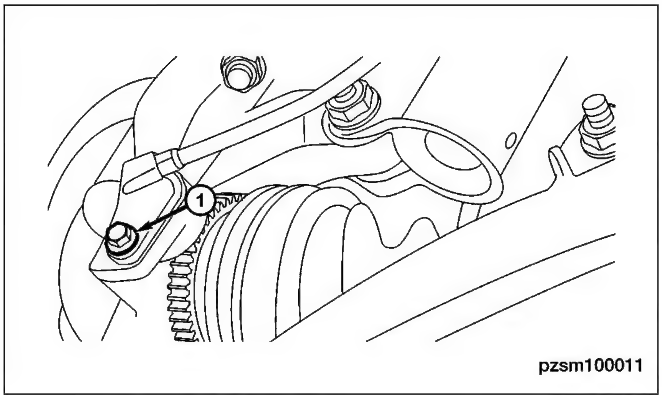
1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly.
(Tighten: Wheel mounting nuts to 110 N·m)
3. Support the engine using an engine support fixture or suitable jack.
4. Remove the engine undercover and splash shields.
5. Remove the intermediate shaft coupling bolt (1) at the steering gear.
(Tighten: Intermediate shaft coupling bolt to 25 ± 5 N·m)



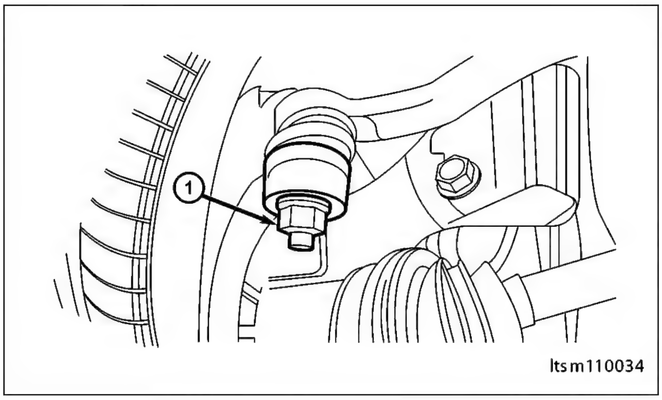
6. Remove the front exhaust pipe retaining bolts (1). (Tighten: Front exhaust pipe bolt to 50 ± 5 N·m)
7. Remove the exhaust pipe (See Exhaust Pipe Removal & Installation in Section 07 Exhaust).



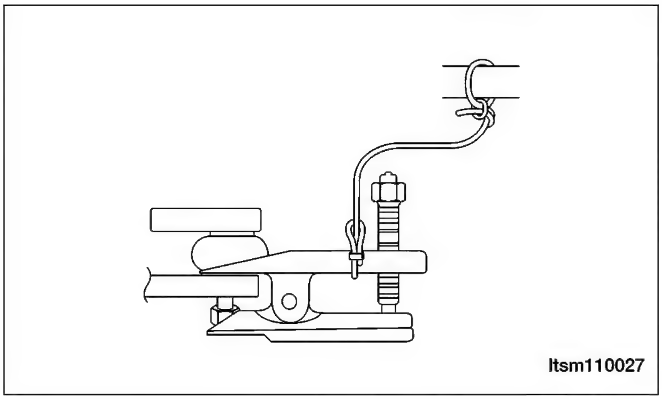
8. Remove the vehicle speed sensor retaining bolt (1) and set it aside. (Tighten: Vehicle speed sensor bolts to 10 ± 1 N·m)



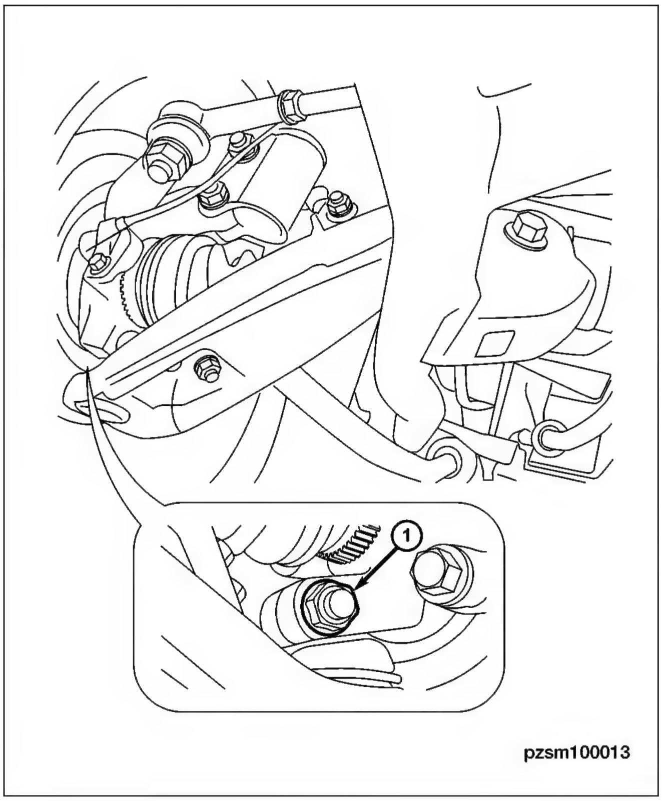
9. On each side of the steering gear, remove the nut (1) attaching the outer tie rod end to the steering knuckle. (Tighten: Outer tie rod end nut to 40 ± 5 N·m)



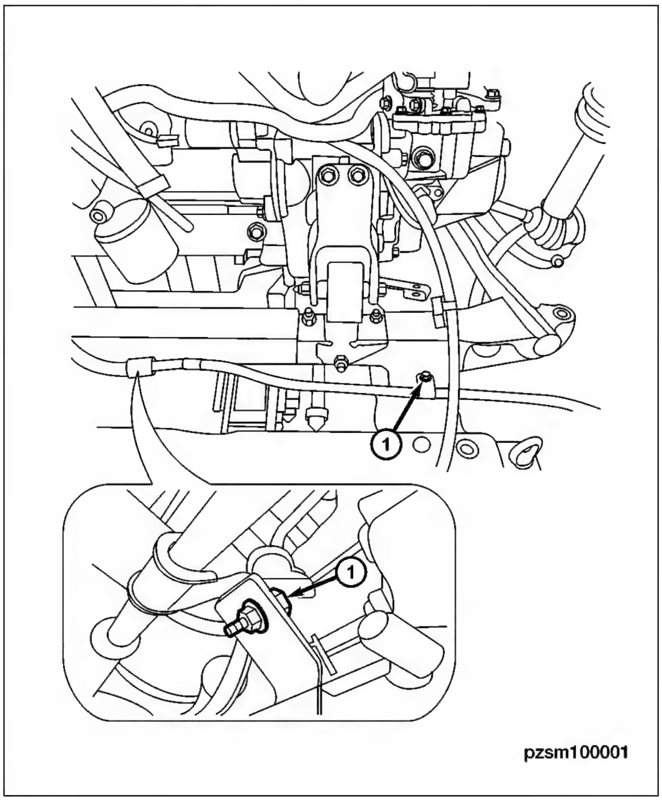
10. Using special tool CH-10002, separate the outer tie rod ends from both steering knuckles.



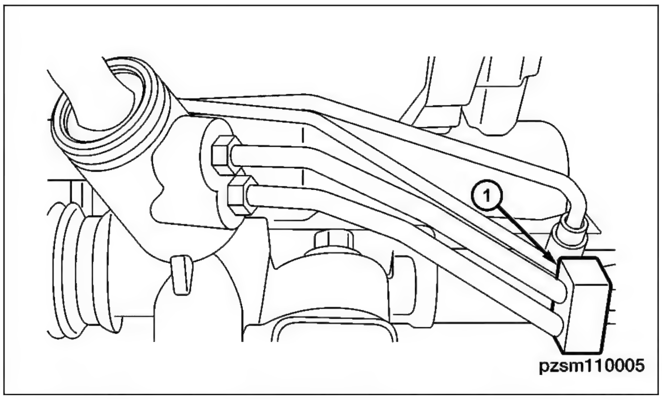
11. Remove the pinch bolt (1) from the steering knuckle.
    (Tighten: Steering knuckle pinch bolt to 110 ± 10 N·m)



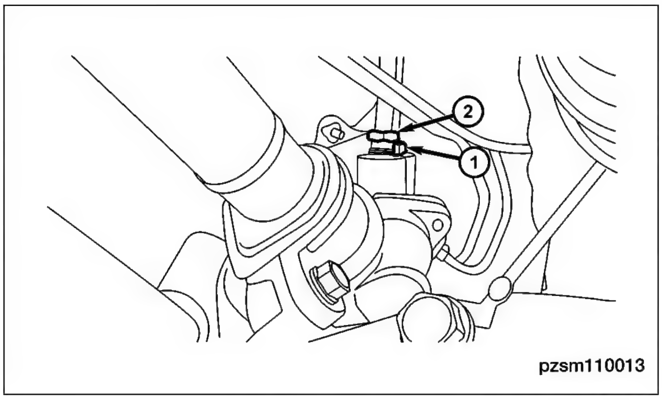
12. Raise and support the vehicle.
13. Remove the A/C pipe bracket retaining bolts (1) on the sub-frame (See Suction Line Removal & Installation in 13 Heating And Air Conditioning).



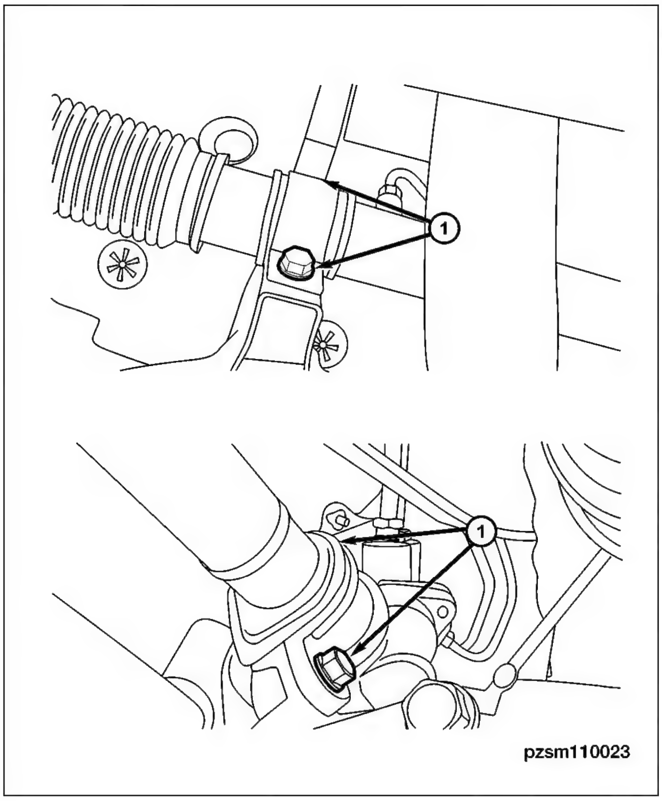
14. Remove the steering gear pressure lines clamp on the front sub-frame (1).



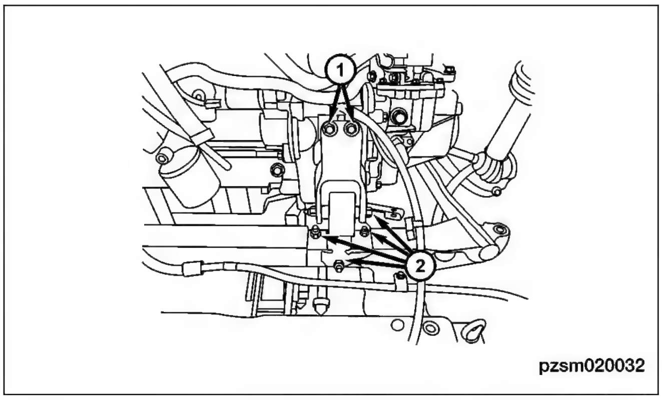
15. Remove the high pressure line (2) and low pressure line (1) from the steering gear.
    (Tighten: High pressure line to steering gear 25 ± 5 N·m)
    (Tighten: Low pressure line to steering gear 25 ± 5 N·m)



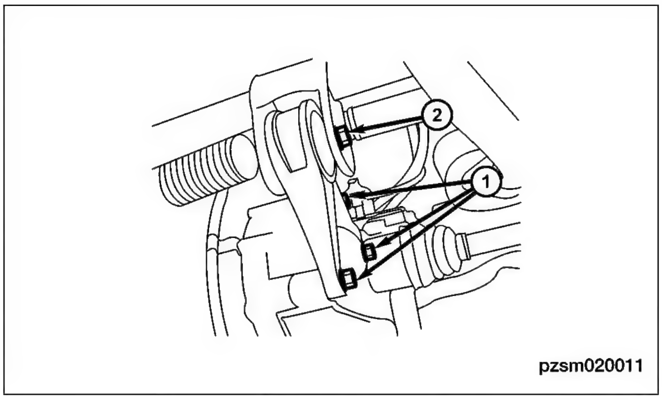
16. Remove the steering gear retaining bolts (1) to the sub-frame.
    (Tighten: Steering gear and sub-frame bolt to 100 ± 10 N·m)



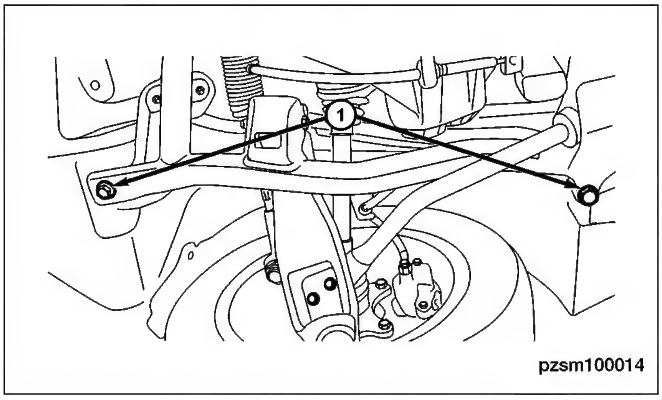
17. Remove the front engine mount bolts (1) and the front engine mount bracket bolts (2).
    (Tighten: Engine front mount bolt to 80 ± 5 N·m)



18. Remove the rear engine mount bolts (1) and the rear engine mount bracket bolts (2).
    (Tighten: Engine rear mount bolts to 60 ± 5 N·m)



19. Remove the sub-frame mounting bolts (1) (4 total) between the sub-frame assembly and the vehicle body.
    (Tighten: Sub-frame mounting bolts to 150 ± 10 N·m)



NOTE :
Before removing the front suspension sub-frame from the vehicle, the location of the sub-frame must be marked on the body of the vehicle. Do this so the sub-frame can be relocated, upon reinstallation, against the body of vehicle in the same location as before removal. If the front suspension sub-frame is not reinstalled in exactly the same location as before removal, the preset front wheel alignment settings (caster and camber) may be lost.

20. Remove the front sub-frame.
21. Separate the front lower control arm and the front stabilizer bar from sub-frame assembly.
22. Separate the front strut rod from the sub-frame.
23. Installation is in the reverse order of removal.

UNIT REPAIR

Front Strut

Disassembly

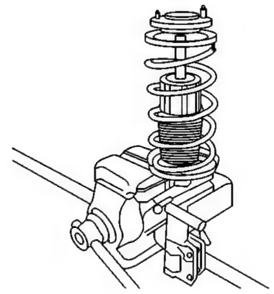
NOTE :
The strut assembly must be removed from the vehicle for it to be disassembled and assembled. For the disassembly and assembly of the strut assembly, use a strut spring compressor, or the equivalent, to compress the coil spring. Follow the manufacturer's instructions closely.

1. Remove the front strut assembly (See Front Strut Removal & Installation in Section 10 Suspension).
2. If both struts are being serviced at the same time, mark both the coil springs and strut assemblies according to which side of the vehicle the strut is being removed from.

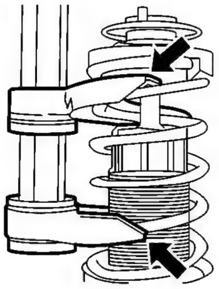
WARNING!

Do not remove the strut rod nut before the coil spring is properly compressed. The coil spring is held under pressure. The coil spring must be compressed, removing spring tension from the upper mount and bearing, before the strut rod nut is removed.

3. If the spring compressor fixture is unable to attach to a workbench, attach the spring compressor to a bench vise.



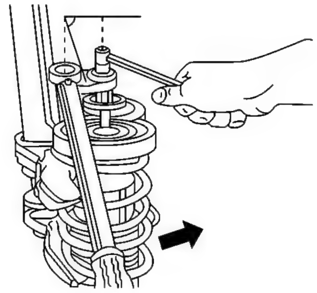
4. Position the strut assembly in the strut coil spring compressor following the manufacturer's instructions and set the lower and upper hooks of the compressor on the coil spring.
5. Loosen the spring compressor, then attach the clamps between the top and bottom of the spring.



6. Compress the coil spring until all coil spring tension is removed from the upper mount and bearing.

CAUTION:
Never use impact or high speed tools to remove the strut rod nut. Damage to the strut internal bearings can occur.

7. Once the spring is sufficiently compressed, install the strut nut wrench on the strut rod nut.
8. Install a deep socket on the end of the strut rod. While holding the strut rod, remove the nut using the strut nut wrench.
   (Tighten: Strut rod nut to 110 ± 10 N·m)



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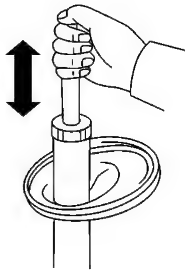
9. Remove the lower spring isolator from the strut seat.
10. Remove the dust shield and jounce bumper.
11. Remove the upper mounting bracket.
12. Remove the upper spring seat and isolator.
13. Release the tension from the coil spring by backing off the compressor drive completely. Release the compressor hooks and remove the coil spring.

Inspection

Inspect the strut assembly for damage and evidence of fluid running from the upper end of the fluid reservoir (actual leakage will be a stream of fluid running down the side of the reservoir tube and dripping off lower end of unit).

Inspect the strut assembly components for the following and replace if necessary:
- Inspect the dust shield for cracks and tears.
- Check the upper mount for cracks and distortion and its retaining studs for any sign of damage.
- Check the bearing and upper spring seat for any binding.
- Inspect the upper and lower spring isolators for material deterioration and distortion.
- Inspect the coil spring for any sign of damage to the coating.



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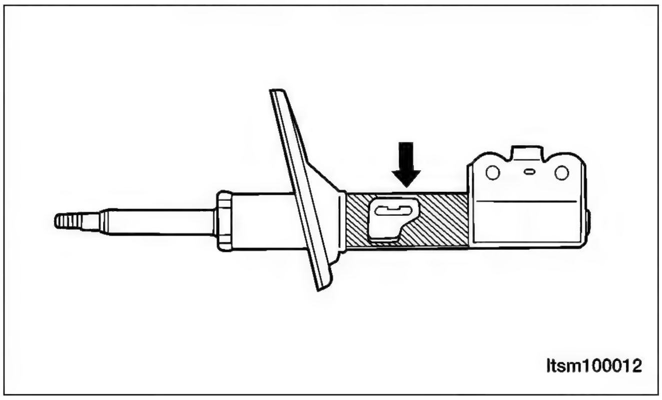
Disposal Notice

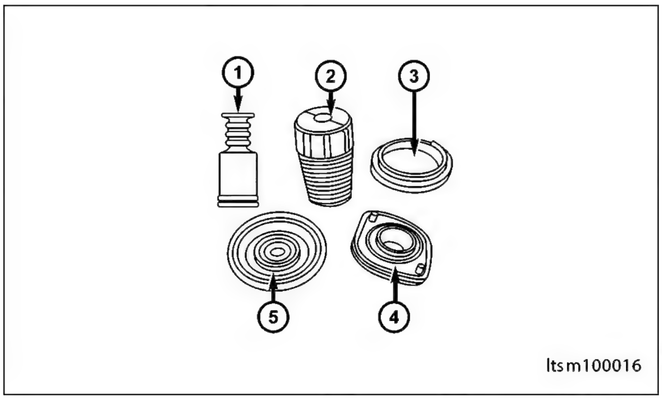
NOTE :
Follow the procedure below to properly dispose of the strut assembly.
- Pull the strut rod to extend the strut rod out as far as possible.

Drill a hole to discharge the gas in the strut assembly cylinder (Drill a hole in the cylinder body according to the figure to discharge the gas).

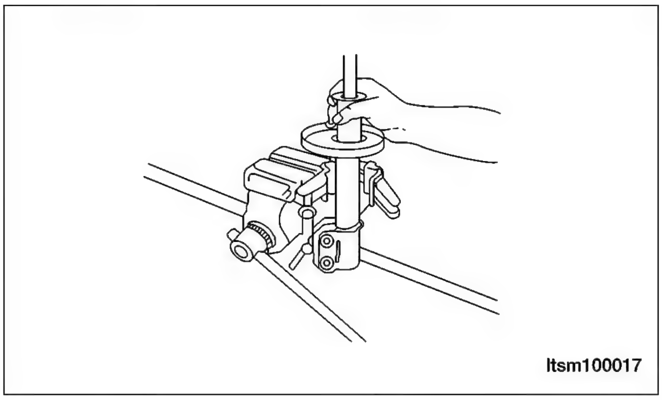


Assembly

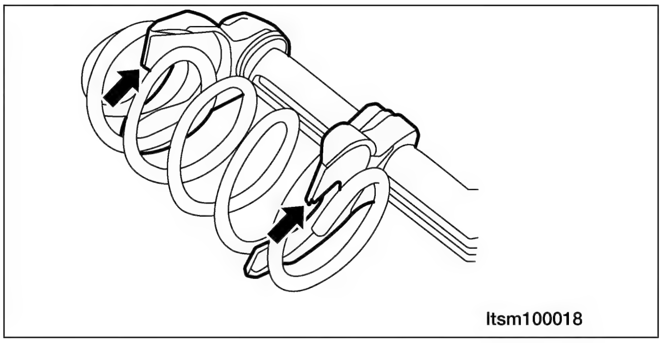
1. Replace all necessary parts prior to reassembly:
    1. Cushion Pad
    2. Dust Boot
    3. Cushion Block
    4. Upper Spring Seat
    5. Upper Spring Mount



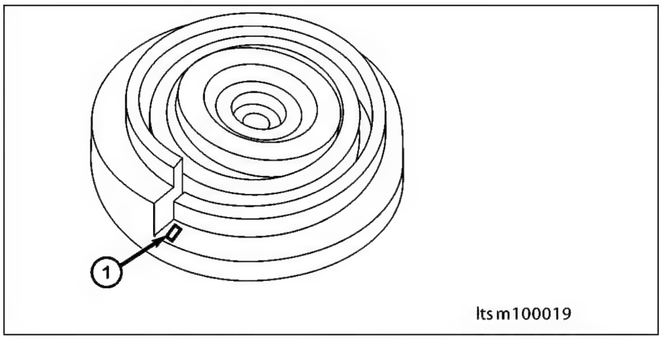
2. Mount the new strut assembly into the fixture.



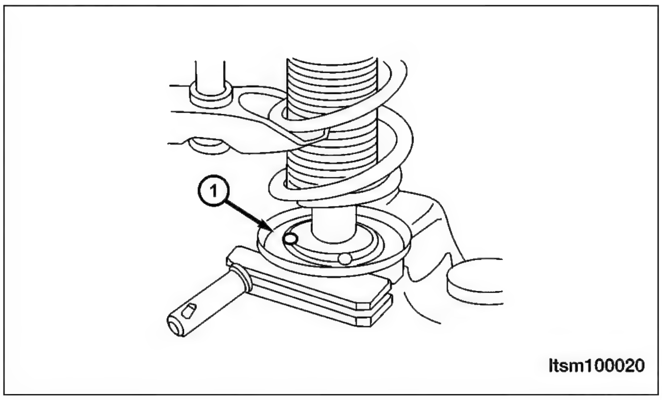
3. Insert the coil spring into the spring compressor.
4. Compress the coil spring to a distance of 120 mm between the two clamps.



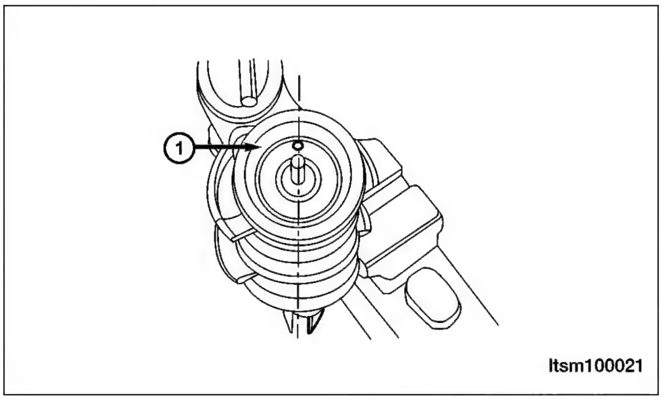
5. Ensure the cushion stopper mark (1) is in line with the mark on the strut.



6. Install the cushion block and pull the piston rod to the bottom.
7. Align the coil spring on the bottom spring holder (1) (the end of the spring should be indexed in the spring pocket).



8. Install the upper spring holder with the index position of 180° angle between the punched hole and the spring strut mounting position (1).



9. Install the upper spacer and bearing.
10. Install the strut rod nut to the strut rod.

REAR SUSPENSION

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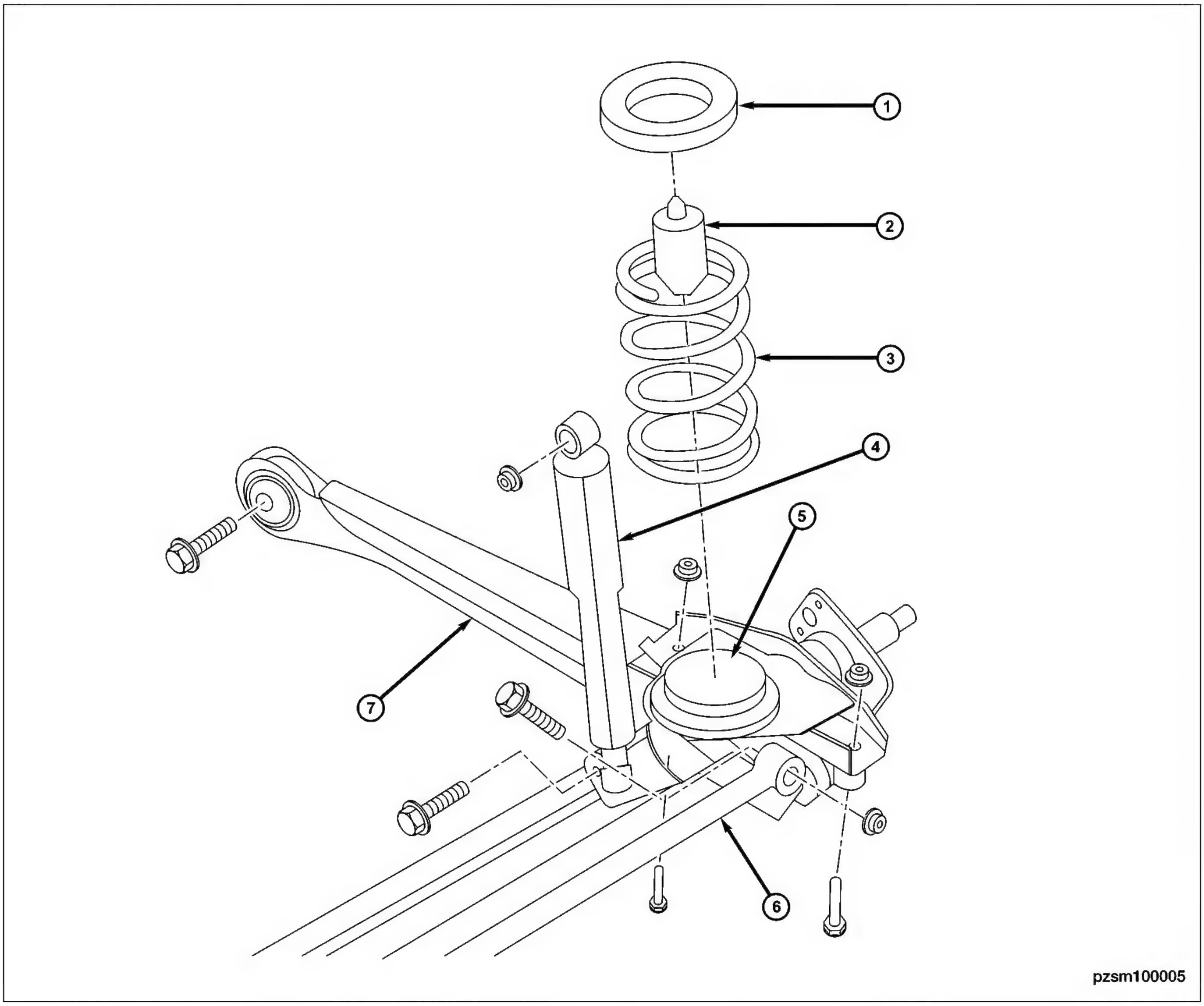
GENERAL INFORMATION

Description



1 - Rear Spring Cushion	5 - Rear Axle Assembly
2 - Rear Bumper Block	6 - Cross Stay Assembly
3 - Rear Coil Spring	7 - Trailing Arm
4 - Rear Strut Assembly	

WARNING!

Only frame contact or wheel lift hoisting equipment can be used on this vehicle. It cannot be hoisted using equipment designed to lift a vehicle by the rear axle. If this type of hoisting equipment is used, damage to rear suspension components will occur.

CAUTION:
If a rear suspension component becomes bent, damaged or fails, no attempt should be made to straighten or repair it. Always replace it with a new component.

Operation

The rear suspension utilizes an rigid axle suspension. It incorporates a cross stay to enhance vehicle stability.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Strut Assembly Lower Mounting Bolt	110 ± 10
Strut Assembly Upper Mounting Nuts	110 ± 10
Cross Stay Assembly	110 ± 10
Trailing Arm Mounting Bolts	110 ± 10

DIAGNOSIS & TESTING

Vehicle Inspection

Inspect the rear axle for the following:

- Check the rear axle for loose bearings.
- Check the rear axle hub for any damage or excessive runout.

Vibration At High Speed

This problem could be a result of:

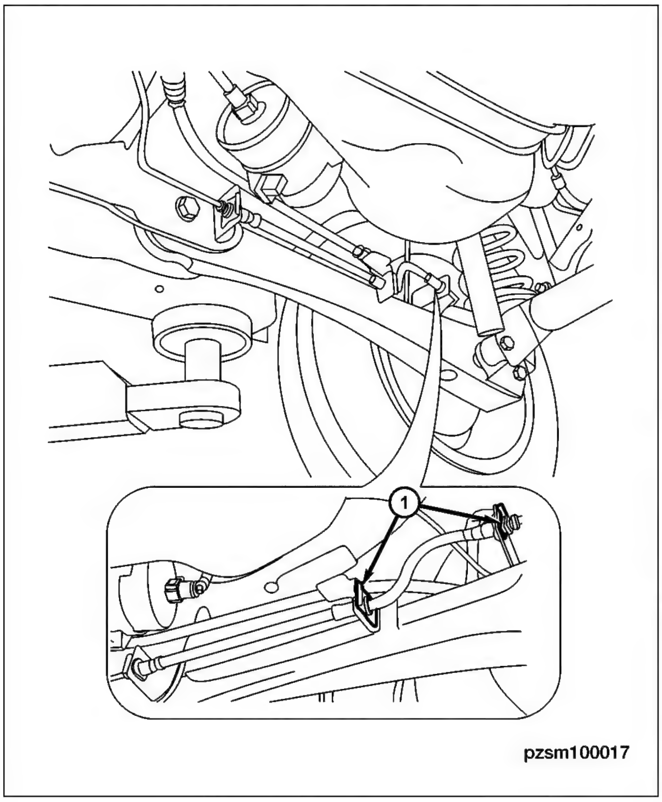
- Foreign material (mud, etc.) packed on the backside of the wheel(s).
- Out of balance tires or wheels.
- Improper tire or wheel runout.

ON-VEHICLE SERVICE

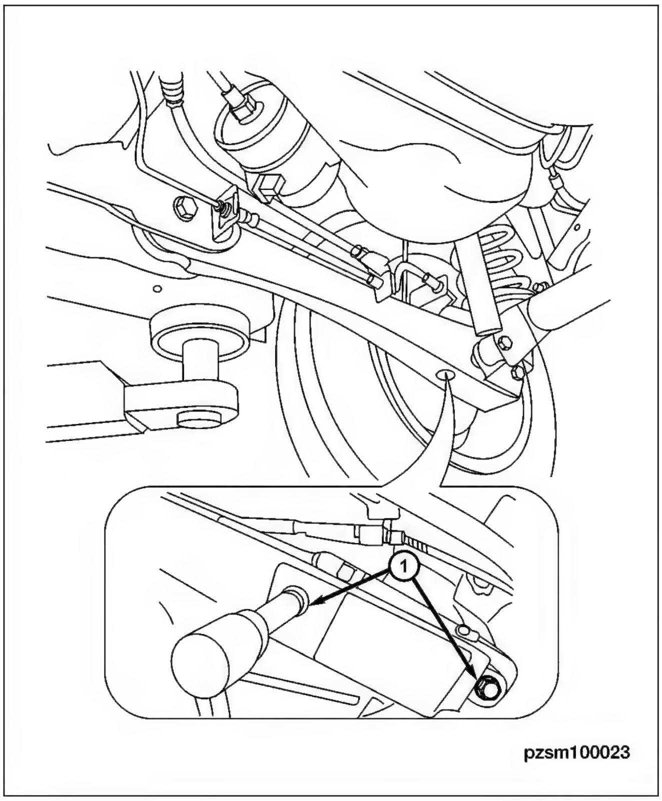
Trailing Arm

Removal & Installation

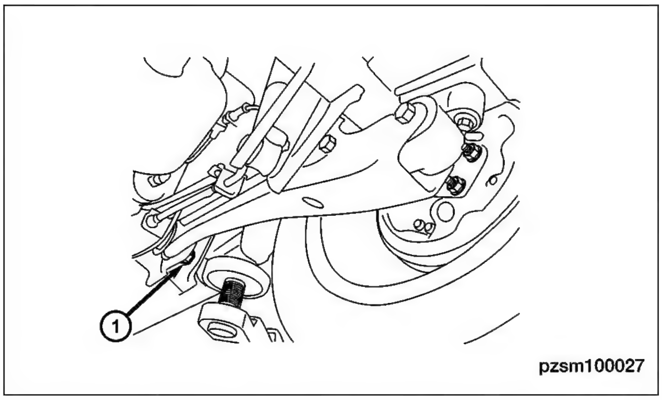
1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly. (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the rear coil spring. (See Rear Coil Spring Removal & Installation in Section 10 Suspension).
4. Remove the two brake oil hose clamps (1) on the rear trailing arm.



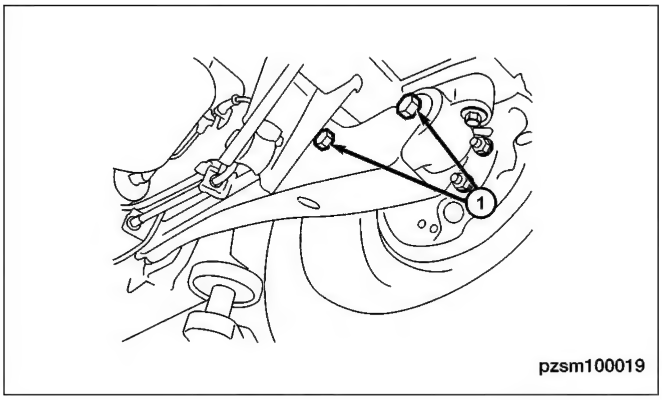
5. Remove the two rear trailing arm bracket to the rear axle retaining bolts (1).
   (Tighten: Rear trailing arm bracket to the rear axle retaining bolts to 110 ± 10 N·m)



6. Remove the rear trailing arm bracket retaining bolt (1) from the rear trailing arm.
   (Tighten: Rear trailing arm bracket retaining bolts to 110 ± 10 N·m)



7. Remove the rear trailing arm assembly.
8. Separated the rear trailing arm to the trailing arm bracket bolts (1).
   (Tighten: Rear trailing arm to the vehicle retaining bolt to 110 ± 10 N·m)



9. Installation is in the reverse order of removal.

Rear Shock Absorber

Description

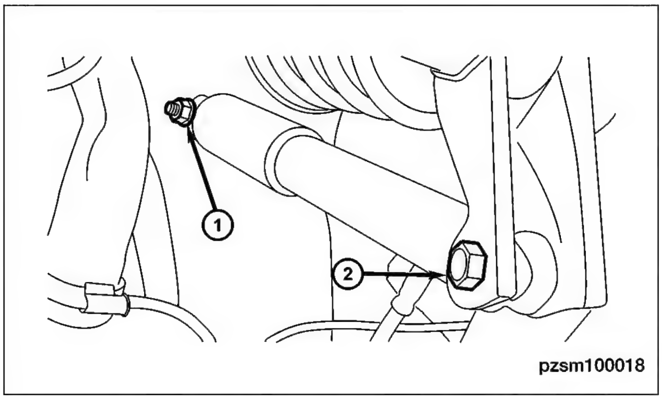
The bottom of the shock absorber assembly mounts to the rear axle. The top of the shock absorber assembly mounts to the body.

Operation

The shock absorber assembly cushions the ride of the vehicle, controls vibration, jounce and rebound of the suspension. The shock absorber dampens jounce and rebound motions of the coil spring and suspension.

Removal & Installation

1. Raise and support the vehicle.
2. Use a jack to support the rear axle.
3. Remove the nut (1) connecting the rear shock absorber to the vehicle body.
   (Tighten: Rear shock absorber to the vehicle body nut to 110 ± 10 N·m)
4. Remove the bolt (2) connecting the rear shock absorber to rear axle.
   (Tighten: Rear shock absorber to the rear axle bolt to 110 ± 10 N·m)



5. Lower the jack and remove the rear coil spring.
6. Remove the rear shock absorber.
7. Installation is in the reverse order of removal.

Rear Coil Spring

Description

The rear coil spring is located between the vehicle body and the rear axle assembly.

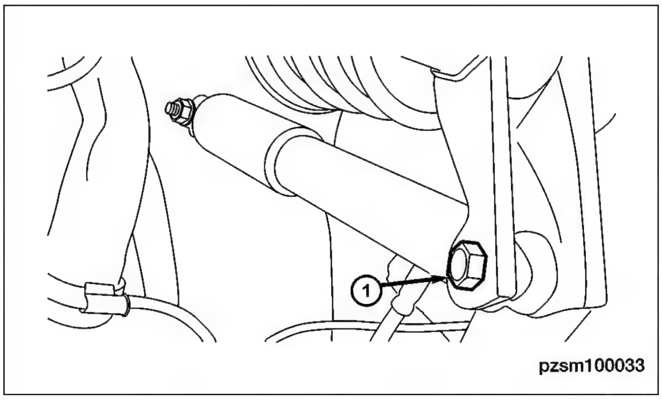
Operation

Coil springs are designed to store energy and subsequently release it. They absorb shock and maintain a force between contacting surfaces. Coil springs are rated for specific vehicle applications.

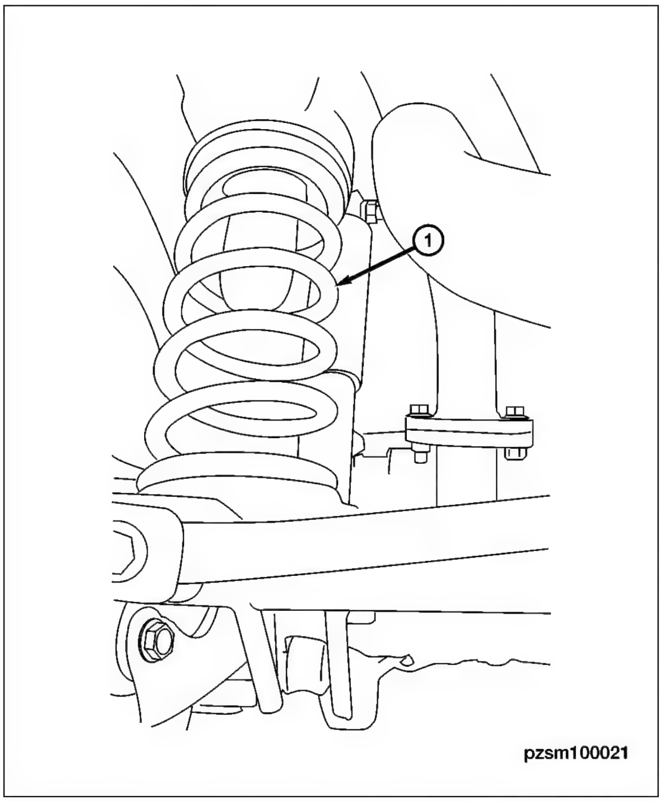
Removal & Installation

1. Raise and support the vehicle.
2. Use a jack to support the rear axle.

3. Remove the retaining bolt (1) that connects the rear shock absorber to rear axle assembly. (Tighten: Rear shock absorber to rear axle assembly bolt to 110 ± 10 N·m)



4. Release the jack slowly.
5. Remove the coil spring (1).



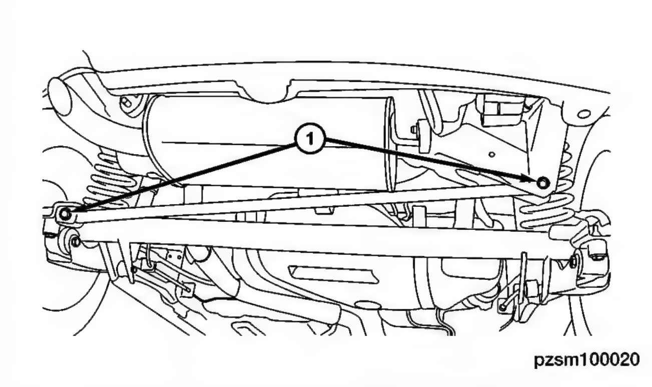
6. Installation is in the reverse order of removal.

Rear Cross Stay

Removal & Installation

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly. (Tighten: Wheel mounting nuts to 110 N·m)

3. Remove the two retaining bolts (1) that connect the rear cross stay to vehicle body.
   (Tighten: Rear cross stay bolts to 110 ± 10 N·m)

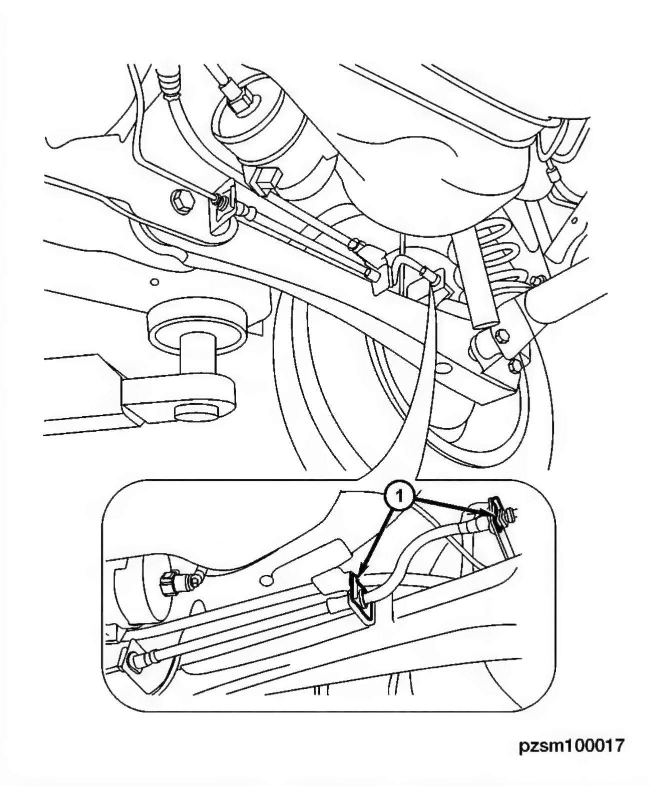


4. Installation is in the reverse order of removal.

Rear Suspension

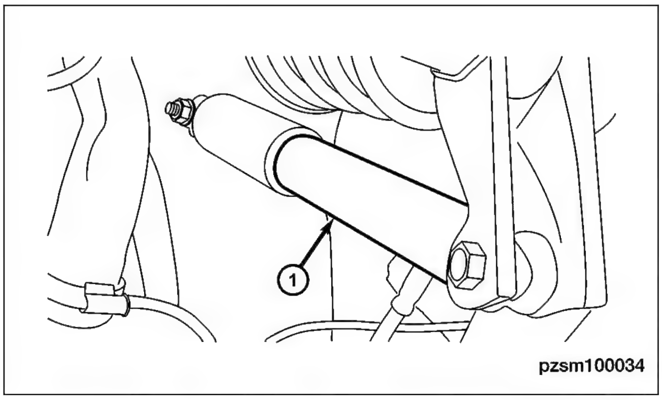
Removal & Installation

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)
3. Use a jack to support the rear axle.
4. Remove the parking brake cable (See Parking Brake Cable Removal & Installation in Section 12 Brakes).
5. Loosen the two brake oil hose clamps (1) on the rear trailing arm and remove it.

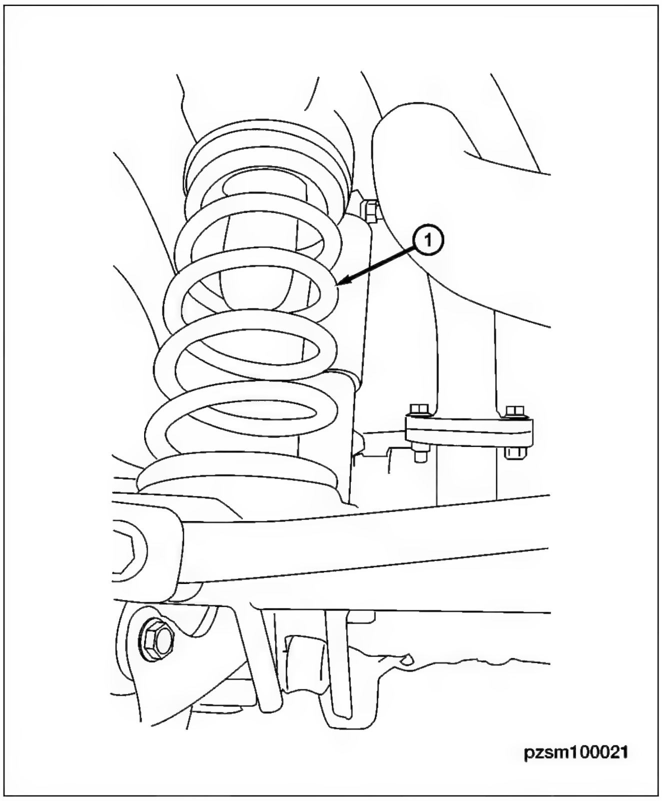


6. Remove the rear brake shoes (See Rear Brake Shoes Removal & Installation in Section 12 Brakes).

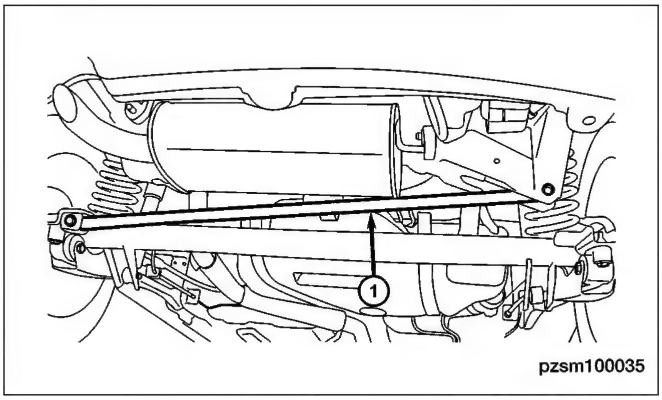
7. Remove the rear shock absorber (1) (See Rear Shock Absorber Removal & Installation in Section 10 Suspension).



8. Remove the rear coil spring (1) (See Rear Coil Spring Removal & Installation in Section 10 Suspen -sion).



9. Remove the rear cross stay (1) (See Cross Stay Removal & Installation in Section 10 Suspension).



10. Remove the parking brake cable from the brake shoes (See Parking Brake Cable Removal & Installation in Section 12 Brakes).
11. Remove the rear trailing arm (See Trailing Arm Removal & Installation in Section 10 Suspension).
12. Lower the jack and remove the rear axle.
13. Installation is in the reverse order of removal.

ALIGNMENT

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GENERAL INFORMATION

Description

Vehicle wheel alignment is the positioning of all interrelated front and rear suspension angles. These angles affect the handling and steering of the vehicle when it is in motion. Proper wheel alignment is essential for efficient steering, good directional stability, and proper tire wear.

The method of checking a vehicle's front and rear wheel alignment varies depending on the manufacturer and type of equipment used. The manufacturer's instructions should always be followed to ensure accuracy of the alignment. On this vehicle, the suspension angles that can be adjusted are as follows:

Front Axle

- Camber
- Caster
- Toe-in

Rear Axle

- Camber
- Toe-in

Check the wheel alignment and make all wheel alignment adjustments with the vehicle standing at its proper curb height specification. Curb height is the normal riding height of the vehicle. It is measured from a certain point on the vehicle to the ground or a designated area while the vehicle is sitting on a flat, level surface.

Operation

Curb Height Measurement

The wheel alignment is to be checked and all alignment adjustments made with the vehicle at its required curb height specification.

- Vehicle height is to be checked with the vehicle on a flat, level surface, preferably a vehicle alignment rack.
- The tires are to be inflated to the recommended pressure.
- All tires are to be the same size as standard equipment.
- Vehicle height is checked with the fuel tank full of fuel, and no passenger or luggage compartment load.
- Vehicle height is not adjustable.
- If the measurement is not within specifications, inspect the vehicle for bent or weak suspension components.
- Compare the parts tag on the suspect coil spring(s) to the parts book and the vehicle sales code, checking for a match.
- Once removed from the vehicle, compare the coil spring height to a new or known good coil spring. The heights should vary if the suspect spring is weak.

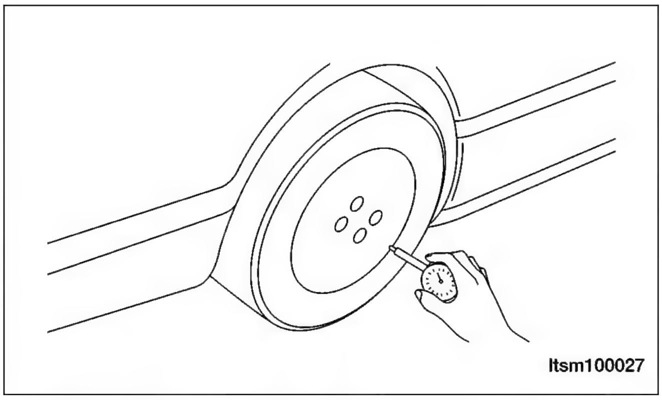
NOTE :
Prior to reading the curb height measurement, the front and rear of the vehicle must be jounced to settle the suspension. Induce jounce by pushing down on the center of the bumper (fascia), using care not to damage the vehicle, moving the vehicle up and down, gradually increasing the suspension travel with each stroke. Release the bumper at the bottom of each stroke, repeating this action several times. Perform this to both front and rear suspensions an equal number of times.

Pre-Wheel Alignment Inspection

Before any attempt is made to change or correct the wheel alignment, the following inspection and necessary corrections must be made to the vehicle to ensure proper alignment.

1. Verify the fuel tank is full of fuel. If the fuel tank is not full, the reduction in weight will affect the curb height of the vehicle and the alignment specifications.
2. The passenger and luggage compartments of the vehicle should be free of any load that is not factory equipment.

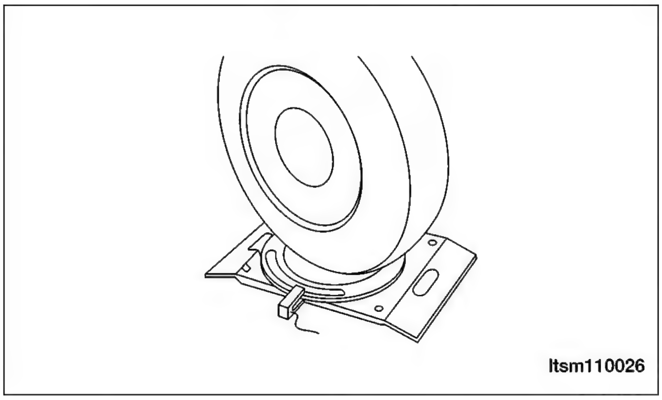
3. Check the tires on the vehicle. The tires are to be inflated to the recommended air pressure. All tires must be the same size and in good condition with approximately the same tread wear.



4. Check the front tire and wheel assemblies for excessive radial runout.
5. Inspect all suspension component fasteners for looseness and proper torque.
6. Inspect all ball joints and all steering linkage for looseness and any sign of wear or damage.
7. Inspect the rubber bushings on all the suspension components for signs of wear or deterioration. If any bushings show signs of wear or deterioration, they should be replaced prior to aligning the vehicle.
8. Check vehicle curb height.

Wheel Alignment Setup

1. Position the vehicle on an alignment rack.



2. Install all required alignment equipment on the vehicle, per the alignment equipment manufacturer's instructions. On this vehicle, a four-wheel alignment is recommended.
3. Read the vehicle's current front and rear alignment settings. Compare the vehicle's current alignment settings to the vehicle specifications for camber, caster and toe-in.

NOTE :
Prior to reading the vehicle's alignment readouts, the front and rear of vehicle should be jounced. Induce jounce (rear first, then front) by grasping the center of the bumper and jouncing each end of the vehicle an equal number of times. The bumper should always be released when vehicle is at the bottom of the jounce cycle.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Camber Adjustment Bolts	110 ± 10
Inner Tie Rod Adjuster Jam Nut	35 ± 3
Wheel Mounting Nuts	110

Front Axle Alignment Specifications

FRONT WHEEL ALIGNMENT	PREFERRED SETTING	ACCEPTABLE RANGE
Camber	+52’	+1°40’ to +2’
Caster	+3°24’	+3°54’ to +2°54’
Toe-Individual	+6’	0’ to +12’

Rear Axle Alignment Specifications

REAR WHEEL ALIGNMENT	PREFERRED SETTING	ACCEPTABLE RANGE
Camber	0’	-30’ to +30’
Toe-Individual	0’	-10’ to +10’

DIAGNOSIS & TESTING

Vehicle Inspection

Inspect the following for damage:

- Inspect the tires.
- Inspect the rims.

Replace any tire or rim that is found to be damaged.

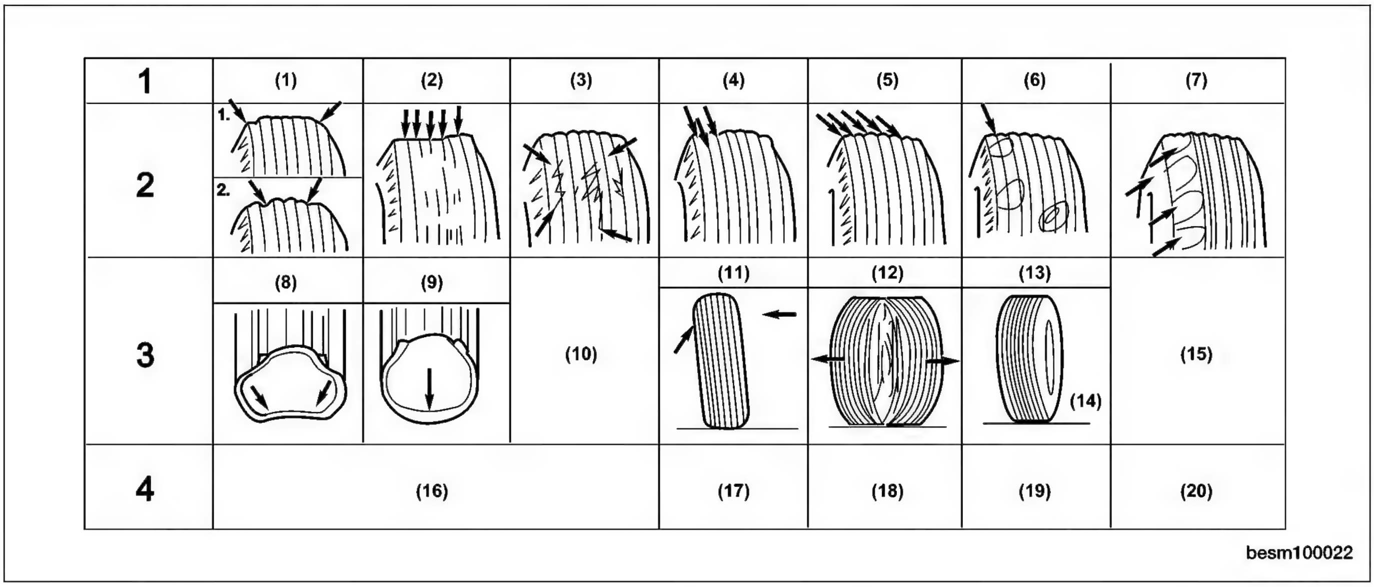
Tire Wear

Inspect the following for accurate tire wear:

- Check the depth of tire remaining tread.
- Standard tire: not less than 1.6 mm.
- Snow tire: 50% tire tread.

If the tread is below the specifications, the tire should be replaced.

Tire Wear Chart



1 Condition:	(1) Rapid Wear At Shoulders	(2) Rapid Wear At Center	(3) Cracked Treads	(4) Wear On One Side	(5) Feathered Edge	(6) Bald Spots	(7) Scalloped Wear
2 Effect:	(1) Excessive Tire Wear	(2) Excessive Tire Wear	(3) Tire Damage	(4) Vehicle Pulls	(2) Excessive Tire Wear	(6) Poor Traction	(7) Excessive Tire Wear
3 Cause:	(8) Under Inflation Or Lack Of Rotation	(9) Over Inflation Or Lack Of Rotation	(10) Under Inflation Or Excessive Speed	(11) Excessive Camber	(12) Incorrect Toe-in	(13) Unbalanced Wheel	(15) Lack Of Rotation / Tires Worn / Alignment / Suspension
4 Correction:	(16) Adjust Tire Pressure To Specifications / Rotate Tires	(16) Adjust Tire Pressure To Specifications / Rotate Tires	(16) Replace Tire	(17) Adjust Camber To Specifications	(18) Adjust Toe-In To Specifications	(19) Balance Wheels	(20) Rotate Tires / Replace Tires / Check Alignment / Suspension

Alignment Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTIONS
Early Tire Wearing	· Incorrect tire pressure. · Incorrect wheel alignment.	· Adjust the tire pressure. · Check the wheel alignment and then adjust.
Tire Noise	· Incorrect tire pressure. · Tire wearing.	· Adjust the tire pressure. · Check the wheel alignment and then adjust.
Road Noise Or Vehicle Body Vibration	· Incorrect tire pressure. · Unbalanced tire. · Deformation of rim or tire. · Tire wearing.	· Adjust the tire pressure. · Check the wheel alignment and then adjust. · Repair or install new suspension component as necessary.
Up-Down Vibration Of The Steering Wheel	· Loose wheel nut or axle. · Unbalanced tire. · Crack or wearing of engine mounting rubber. · Crack or wearing of transmission bracket rubber.	· Fasten wheel nut. · Check the wheel alignment and then adjust. · Repair or install new suspension component as necessary. · Repair or install new engine or transmission mounting rubber as necessary.
Circular Vibration Of The Steering Wheel	· Loose wheel nut or axle. · Unbalanced tire. · Deficient tire pressure. · Damage or wearing of front wheel bearing. · Failure of steering system.	· Fasten wheel nut. · Adjust the tire pressure. · Check the wheel alignment and then adjust. · Repair or install new suspension component as necessary.
Steering Wheel Deflecting To Single Side	· Incorrect tire pressure. · Excessive tire wearing. · Failure of steering system. · Failure of suspension system.	· Adjust the tire pressure. · Check steering system. · Check the wheel alignment and then adjust. · Repair or install new suspension component as necessary.
Unstable Driving	· Loose wheel nut. · Failure of steering system. · Failure of suspension system.	· Adjust the tire pressure. · Check steering system. · Check the wheel alignment and then adjust. · Repair or install new suspension component as necessary.
Heavy Steering Wheel	· Incorrect tire pressure. · Failure of steering system. · Failure of suspension system. · Incorrect wheel alignment.	· Adjust the tire pressure. · Check steering system. · Check the wheel alignment and then adjust. · Repair or install new suspension component as necessary.
Bad Alignment Return Of Steering Wheel	· Incorrect tire pressure · Failure of steering system · Failure of suspension system	· Adjust the tire pressure. · Check steering system. · Check the wheel alignment and then adjust. · Repair or install new suspension component as necessary.

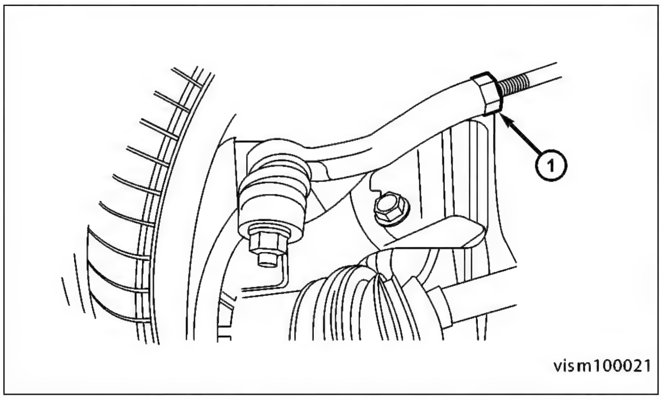
ON-VEHICLE SERVICE

Front Wheel Alignment

Front Axle Toe-In Adjustment

CAUTION:
Do not twist the inner tie rod steering gear boot (bellows) while turning the inner tie rod during front toe-in adjustment. It may be necessary to remove the clamp where the boot meets the inner tie rod.

1. Loosen the tie rod adjusting jam nut (1).
   (Tighten: Tie rod adjusting jam nut to 35 ± 3 N·m)
2. Grasp the inner tie rod shaft and adjust the tie rod end until the front toe-in is set to the proper specification.



3. Make sure the inner tie rod steering gear boot is not twisted. If removed, reinstall the clamp where the boot meets the inner tie rod.
4. Remove the alignment equipment.
5. Lower vehicle and jounce the front and rear of the vehicle.

Front Camber Adjustment

NOTE :
The front-axle camber cannot be adjusted.

FRONT WHEEL ALIGNMENT		
ALIGNMENT ANGLE	**PREFERRED SETTING**	**ACCEPTABLE RANGE**
Camber	+ 52’	+ 1°40’ to + 2’
Caster	+ 3°24’	+ 3°54’ to + 2°54’
Toe-Individual	+ 6’	0’ to + 12’

Rear Wheel Alignment

Rear Toe-In & Rear Camber Adjustment

NOTE :
If the vehicle has been in an accident causing the rear axle components to be damaged, the damaged components must be replaced before performing a rear wheel alignment.

REAR WHEEL ALIGNMENT		
ALIGNMENT ANGLE	**PREFERRED SETTING**	**ACCEPTABLE RANGE**
Camber	0’	- 30’ to + 30’
Toe-Individual	0’	-10’ to +10’

WHEELS AND TIRES

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GENERAL INFORMATION

Description

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

Operation

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain, in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe application of brakes
- High-speed driving
- Taking turns at excessive speeds
- Striking curbs and other obstacles
- Operating vehicle with over or under inflated tire pressures

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Wheel Mounting Nuts	110

Tire Pressure Specifications

DESCRIPTION	STANDARD COLD INFLATION PRESSURE (kPa)
Front Wheel	230
Rear Wheel	210
Spare Wheel	300

Tire Specifications

TIRE SPECIFICATION	TIRE SIZE - 175
Sectional Width	175
Aspect Ratio	60
Wheel Radius	R14
Speed Rating	79H

Rim Out-Of-Round Specifications

DESCRIPTION	MAXIMUM RUN-OUT (mm)
Steel Rim	5
Aluminum Rim	3

DIAGNOSIS & TESTING

Vehicle Inspection

Visual inspection of the vehicle is recommended prior to road testing or performing any other procedure. Raise the vehicle on a suitable hoist.

Inspect the following:
- Inspect tires and wheels for damage, mud packing and unusual wear; correct as necessary.
- Check and adjust tire pressure to the pressure listed on the label attached to the driver's door opening.

Tire and Wheel Vibration

Tire and wheel imbalance, runout and force variation can cause vehicles to exhibit steering wheel vibration.

NOTE :
Balance equipment must be calibrated and maintained per equipment manufacturer's specifications.

Tire Wear Patterns

Tire wear patterns can be traced to the following tire conditions:
- Under inflation will cause wear on the shoulders of tire.
- Over inflation will cause wear at the center of tire.
- Excessive camber causes the tire to run at an angle to the road. One side of tread is then worn more than the other.
- Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread.

NOTE :
Tread wear indicators are molded into the bottom of the tread grooves. When tread depth is 1.6 mm, the tread wear indicators will appear as a band. Tire replacement is necessary when indicators appear in two or more grooves, or if localized balding occurs.

Wheel Out-Of-Round Inspection

- Raise vehicle and securely support it.
- Attach a dial indicator on the edge of the rim and measure its unevenness.
- Replace the rim if necessary.

NOTE :
On both edges of the rim, the maximum allowed average value of the unevenness should not exceed the following:

MAXIMUM RIM OUT-OF-ROUND	
Steel Rim	5 mm
Aluminum Rim	3 mm

ON-VEHICLE SERVICE

Tire Replacement & Repair

Description

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

WARNING!

Failure to equip the vehicle with tires having adequate speed capability can result in sudden tire failure.

In order to maintain the speed capability of the vehicle, replacement tires must have speed ratings equal to or higher than those fitted to the vehicle as original equipment. If tires with lower speed ratings are fitted, the vehicle's handling may be affected and the speed capability of the vehicle may be lowered to the maximum speed capability of the replacement tires. To avoid an accident resulting in severe or fatal injury, consult the tire manufacturer in regards to maximum speed ratings.

Replacement Procedure

Note the following guidelines when replacing a tire:

- It is recommended that tires equivalent to the original equipment tires be used when replacement is needed.
- Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.
- The use of tires smaller than the minimum tire size approved for the vehicle can result in tire overloading and failure.
- Use tires that have the approved load rating for the vehicle and never overload them.
- Failure to equip the vehicle with tires having adequate speed capability can result in sudden tire failure and loss of vehicle control.
- The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

Perform the following when replacing a tire:

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly.
3. Deflate the tire completely before removing the tire from the wheel.
4. Use lubrication such as a mild soap solution when dismounting or mounting tire.
5. Replace the tire with a tire approved for the vehicle.
6. Use tools free of burrs or sharp edges which could damage the tire or wheel rim.
7. Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.
8. Balance the tire and wheel assembly.
9. Install the tire and wheel assembly and install the wheel mounting nuts.
   (Tighten: Wheel mounting nuts to 110 N·m)

Repair Procedure

Note the following guidelines when performing a tire repair:

- For proper repairing, a radial tire must be removed from the wheel.
- Repairs should only be made if the defect, or puncture, is in the tread area.
- The tire should be replaced if the puncture is located in the sidewall.

Perform the following when repairing a tire:

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly.
3. Deflate the tire completely before removing the tire from the wheel.
4. Use lubrication such as a mild soap solution when dismounting or mounting tire.
5. Repair the tire only if the defect, or puncture, is in the tread area.
6. Use tools free of burrs or sharp edges which could damage the tire or wheel rim.
7. Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

8. Install the tire and wheel assembly and install the wheel mounting nuts.
   (Tighten: Wheel mounting nuts to 110 N·m)

Wheel Assembly

Description

Original equipment wheels are designed for operation up to the specified maximum vehicle capacity.

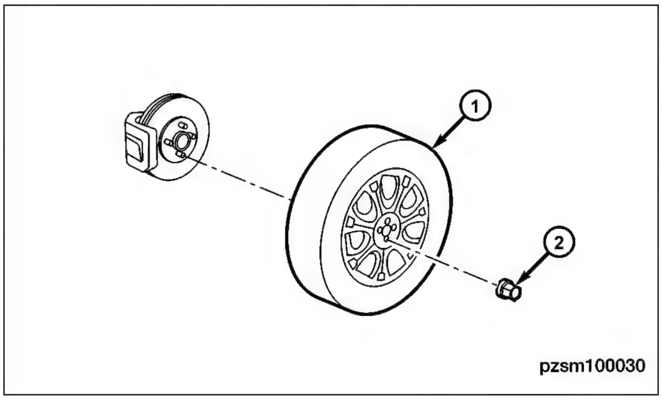
Inspect wheels for the following:
- Dents or cracks
- Damaged wheel bolt holes
- Air leaks from any area or surface of the rim
- Excessive run out

NOTE :
Do not attempt to repair a wheel by hammering, heating or welding.

NOTE :
The wheel nuts are designed for specific applications. Do not use replacement bolts with a different design or lesser quality.

Removal & Installation

1. Raise and support the vehicle.
2. If the vehicle is equipped with wheel center caps that cover the wheel nuts, remove the cap with an appropriate removal tool utilizing the notch located between the wheel and the outer edge of the cap.
   NOTE: Use care not to damage the finish on the wheel.
3. Remove the wheel mounting nuts (2) and the tire and wheel assembly (1).
   (Tighten: Wheel mounting nuts to 110 N·m)
4. Installation is in the reverse order of removal.



Wheel Balance

Description

Balance the wheel assembly, if necessary follow the wheel balancer manufacturer’s instructions.
- Road test the vehicle for at least 5 miles.
- If the vibration persists, continue with Diagnosis & Testing procedure.

NOTE :
- Wheel balance equipment must be calibrated and maintained as outlined by the equipment manufacturer’s specifications.
- Wheel weight must fit the rim.

Wheel Balance Procedure

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the wheel assembly.
3. Perform a dynamic balance test.

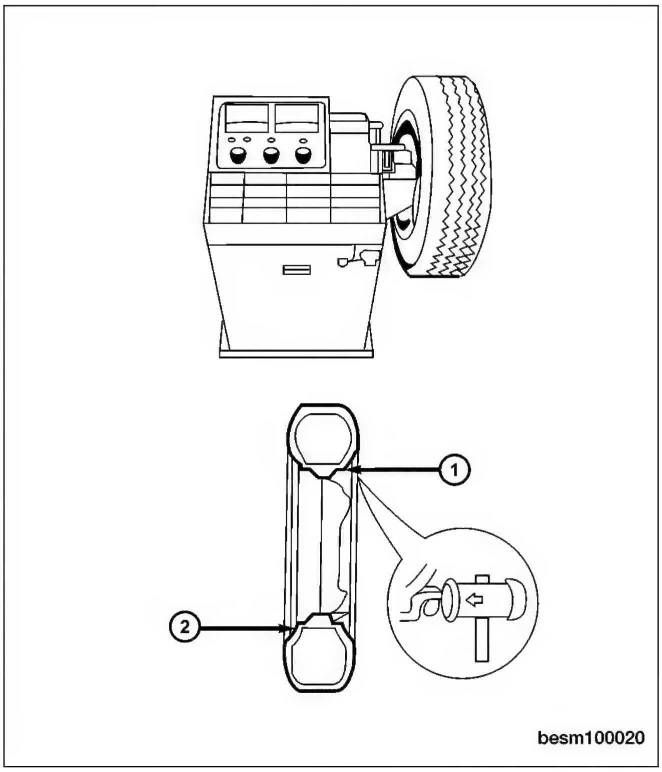
NOTE :
A wheel requiring 5g or less of weight per side is considered to be within the proper specifications for a wheel balance.

4. Install the appropriate wheel weights on the inner (2) and outer (1) edges of the rim until the wheel is balanced within specifications.

NOTE :
Not more than one wheel weight can be attached to each side of the wheel, with its maximum weight not exceeding 40g.

CAUTION:
Use caution not to damage wheel weights during tire and wheel installation.

5. Install the wheel assembly and install the wheel mounting nuts.
   (Tighten: Wheel mounting nuts to 110 N·m)



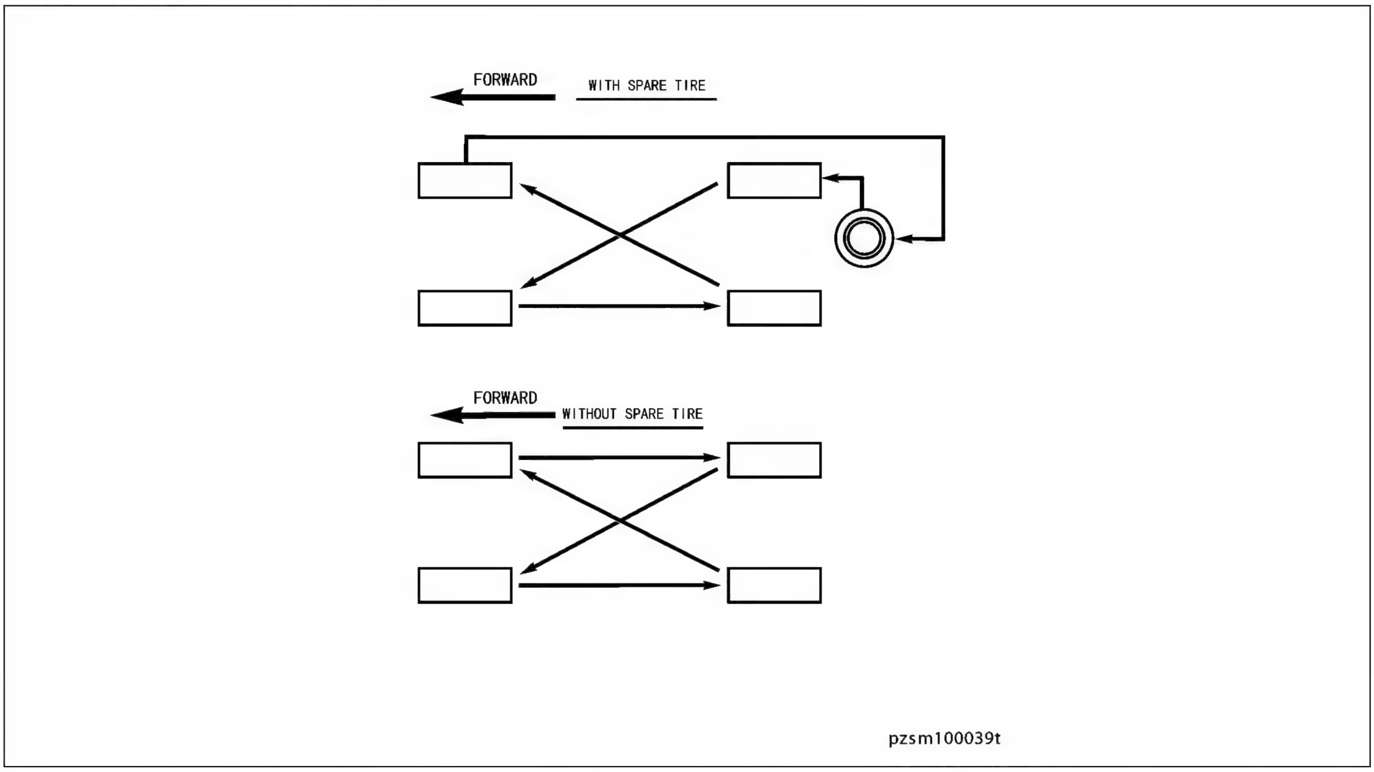
Tire Rotation

Description

Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals.

The benefits of tire rotation are:
- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

Non-Directional Tires



The suggested method of tire rotation is shown. Other rotation methods can be used, but they will not provide all the tire longevity benefits.

NOTE :
Only the four-tire rotation method may be used if the vehicle is equipped with a compact or temporary spare tire.

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly.
3. Rotate the tire to the desired location.

CAUTION:
Use caution not to damage wheel weights during tire and wheel installation.

4. Install the tire and wheel assembly and install the wheel mounting nuts.
   (Tighten: Wheel mounting nuts to 110 N·m)

Directional Tires

Some vehicles may be fitted with special high-performance tires having a directional tread pattern. These tires are designed to improve traction on wet pavement. To obtain the full benefits of this design, the tires must be installed so that they rotate in the correct direction. This is indicated by arrows on the tire sidewalls. When being installed, extra care is needed to ensure that this direction of rotation is maintained.

1. Remove the wheel mounting nuts and the tire and wheel assembly.
2. Rotate the tire to the desired location.

CAUTION:
Use caution not to damage wheel weights during tire and wheel installation.

3. Install the tire and wheel assembly and install the wheel mounting nuts.
   (Tighten: Wheel mounting nuts to 110 N·m)

STEERING
11

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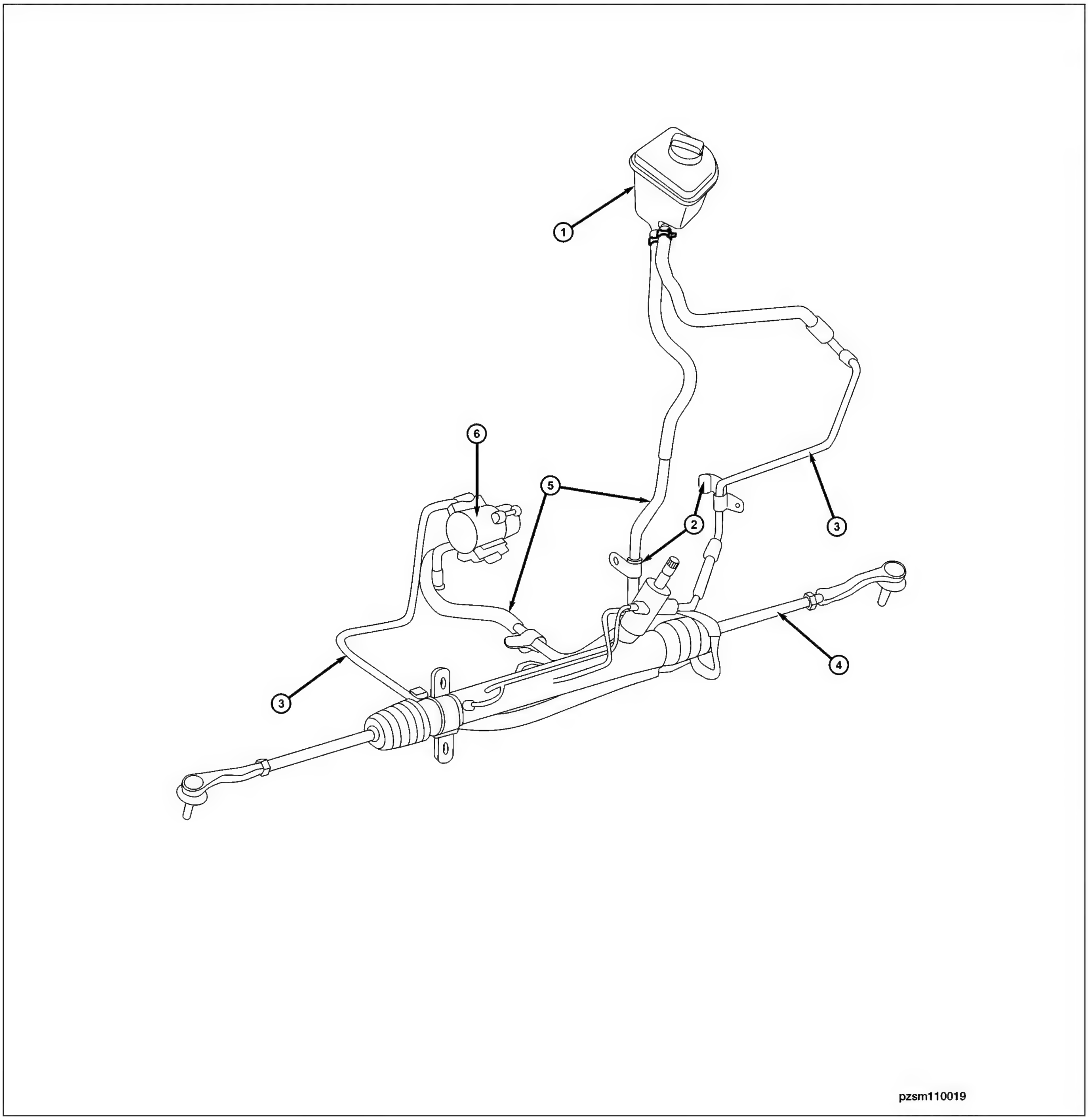
GENERAL INFORMATION

Description

The power steering pump is a constant flow rate and displacement vane type pump. The pump reservoir supplies fluid to the pump body. The pump is connected to the steering by the pressure and return lines. The steering gear used is a rack and pinion type gear.



1 - Power Steering Fluid Reservoir	4 - Power Steering Gear Assembly
2 - Power Steering Fluid Pressure Hose Bracket	5 - Power Steering Fluid Return Hose
3 - Power Steering Fluid Pressure Hose	6 - Power Steering Pump

Operation

Turning of the steering wheel is converted into linear travel through the meshing of the helical pinion teeth with the rack teeth within the steering gear. The lateral travel pushes and pulls the tie rods to change the direction of the vehicle's front wheels.

Power assist steering is provided by a belt driven rotary type pump. It directs fluid through power steering fluid hoses to the power steering gear where it is used to assist the driver's turning effort.

Manual steering control of the vehicle can be maintained if power steering assist is lost. However, under this condition, steering effort is significantly increased.

WARNING!

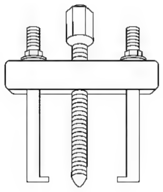
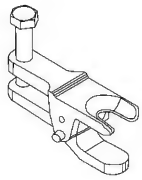
Power steering fluid, engine parts and exhaust system may be extremely hot if engine has been running. Do not start engine with any loose or disconnected hoses. Do not allow hoses to touch hot exhaust manifold or catalyst. Fluid level should be checked with the engine off to prevent personal injury from moving parts.

Specifications

Fluid Specifications

DESCRIPTION	CAPACITY (L)
Power Steering Fluid (ATF III)	1.0

Special Tools

Steering Wheel Puller	 besm110015
Ball Joint Separator CH-10002	 besm020086

DIAGNOSIS & TESTING

Power Steering Troubleshooting Chart

Review this troubleshooting chart any time a power steering system problem is present. This chart will help determine if the power steering pump or power steering gear is functioning properly.

CONDITION	POSSIBLE CAUSES	CORRECTION
Steering Wheel Is Loose	· Steering wheel retaining bolt loose. · Loose steering column to instrument panel fasteners.	· Check steering wheel retaining bolt torque and tighten to specifications if necessary. · Check steering column to instrument panel fastener torque and tighten to specifications if necessary.
Steering Catches, Surges Or Sticks In Certain Positions Or Is Difficult To Turn	· Low power steering fluid level. · Tire(s) not properly inflated. · Loose or slipping power steering/ accessory drive belt. · Lack of lubrication in steering gear outer tie rod end(s).	· Check fluid level and fill to proper level if necessary. Check for leaks. Make sure all air is bled from system. · Check and inflate tires to the specified pressure. · Verify belt tension. Replace belt auto-tensioner and belt if necessary. · Check the outer tie rod ends.
Steering Wheel Does Not Return To Center Position	· Tire(s) not properly inflated. · Improper front wheel alignment.	· Check and inflate tires to the specified pressure. · Check and adjust wheel alignment if necessary.
Excessive Steering Wheel Kickback From Road Inputs	· Air in power steering fluid. · Power steering gear loose on cradle/sub-frame. · Steering column, coupling or intermediate shaft worn or loose. · Power steering pump flow is too low.	· Inspect for excessive air bubbles in fluid (fluid will appear foamy and lighter in color). Inspect hoses for leaks and replace if necessary. Bleed air from fluid. · Inspect gear mounting bolts. Replace if necessary and tighten to specifications. · Rotate steering wheel back-and-forth while inspecting intermediate shaft going into steering gear. Look for excessive free-play. Retighten if loose bolt is found. Replace steering column, coupling or intermediate shaft if necessary. · Perform power steering flow and pressure test. Look for low or erratic flow or pressure. Replace power steering pump if necessary.

Power Steering Fluid Troubleshooting Chart

NOTE :
Extremely cold temperatures may cause power steering fluid aeration. The air should work its way out of the system as the fluid warms.

CONDITION	POSSIBLE CAUSES	CORRECTION
Low Fluid Level With Visible Leak	· Loose power steering hose fittings or connections. · Damaged or missing O-ring at power steering hose tube nuts. · Power steering line or hose failure. · Power steering component leaking (reservoir, pump, gear).	· Check torque on all tube nuts (at gear and pump). Inspect clamps at all rubber hose connections for correct position, damage and tension. Tighten tube nuts to specifications as required. Reposition or replace clamps at hose connections. Clean joints and reinspect for leaks. · Remove tube nut and inspect O-ring. If damaged or missing, replace O-ring. Clean joints and reinspect for leaks. · Clean fluid from around suspect areas. Run vehicle and inspect for leaks. Look inside reservoir to see if air is being ingested. Replace hoses if necessary. · Clean fluid from around suspect areas. Run vehicle and inspect for leaks. Look inside reservoir to see if air is being ingested. Replace power steering component if necessary.
Aerated Fluid	· Low power steering fluid level. · Air leak at power steering supply hose, reservoir or pump.	· Check fluid level and fill to proper level if necessary. Check for leaks. Make sure all air is bled from system. · Inspect components. Place a hand vacuum pump with reservoir and verify that system can sustain vacuum. System should not lose more than 1 psi in 2 minutes (make sure vacuum pump is sealed well to the reservoir). Replace steering component if necessary.

ON-VEHICLE SERVICE

Power Steering Filling and Flushing

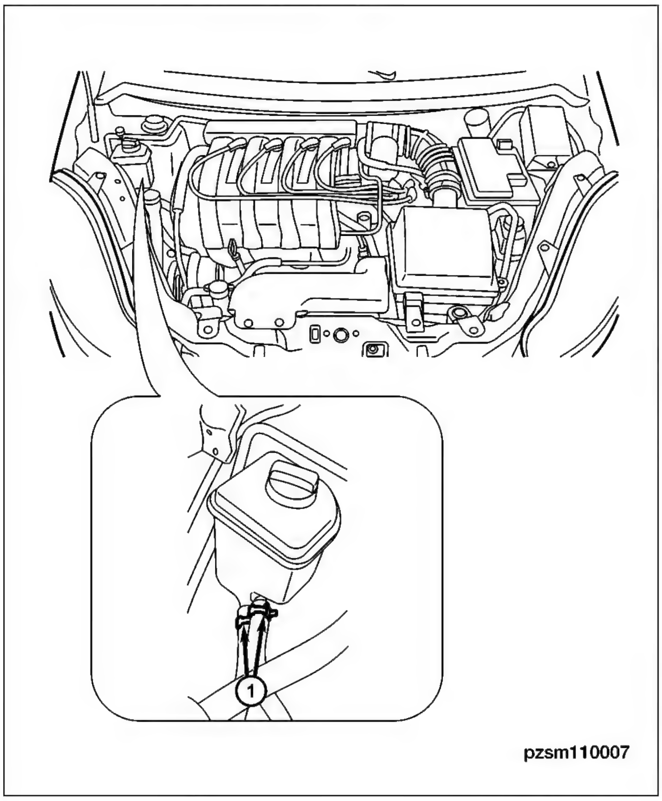
Filling

1. Fill the power steering fluid reservoir to the proper level and let the fluid settle for at least two minutes.
2. Start the engine and let it run for a few seconds, then turn the engine off.
3. Add fluid if necessary.
4. Repeat the above procedure until the fluid level remains constant after running the engine.
5. When the steering fluid temperature is relatively high, the steering fluid level will approach to the “MAX” position.
6. When the steering fluid cools down, the steering fluid level may approach to the “MIN” position.

NOTE :
If the steering fluid is extremely foamy or milky looking, allow the vehicle to stand a few minutes and repeat the procedure.

Flushing

1. Raise and support the vehicle.
2. Remove the steering fluid reservoir release cap.
3. Siphon out the contaminated power steering fluid from the power steering reservoir.
4. Remove the power steering fluid return hose (1) from the power steering reservoir.
5. Install a plug to the return hose fitting on the fluid reservoir.



6. Insert the power steering fluid return hose into a container for the discharged power steering fluid.
7. Fill the power steering fluid reservoir.
8. Start the engine and idle.
9. Turn the steering wheel several times from left to right.
10. Let the engine idle until the return hose discharges clean power steering fluid.
11. Stop the engine and remove the plug from the power steering reservoir.
12. Reinstall the power steering return hose to the power steering reservoir.

13. Fill the power steering system (See Filling Procedure in Power Steering Filling and Flushing in Section 11 Steering).

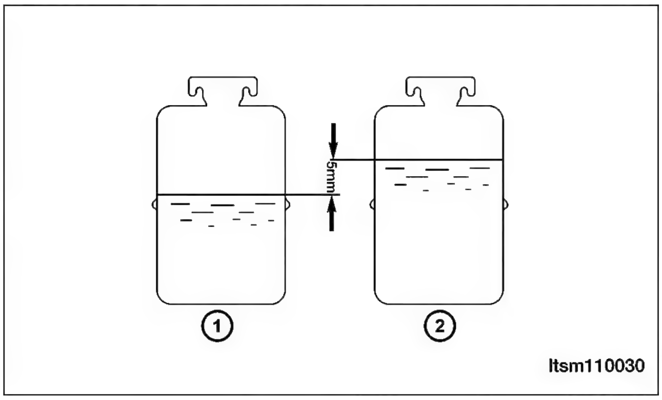
NOTE :
Approximately 1.0L of power steering fluid should be needed to fully flush the power steering reservoir. DO NOT mix other fluids in the power steering fluid.

Inspection

1. If the power steering fluid level is low, inspect the entire power steering system for potential leaks.

CAUTION:
DO NOT operate the vehicle with foamy steering fluid for an extended period. This may cause pump damage.

2. Perform the following to inspect the power steering fluid reservoir level:
   - Park the vehicle on a level surface.
   - Start the engine.
   - Turn the steering wheel several times to heat the power steering fluid to 50° - 60°C.
   - With the engine running, turn the steering wheel left and right to the wheel stops and repeat this several times.
   - Check the power steering fluid reservoir to see whether there is foam or milky fluid present. Check the fluid level difference between engine off (2) and engine running (1). If the fluid level variation exceeds 5 mm, air is in the system and the air should be bled from the power steering system.



STEERING COLUMN

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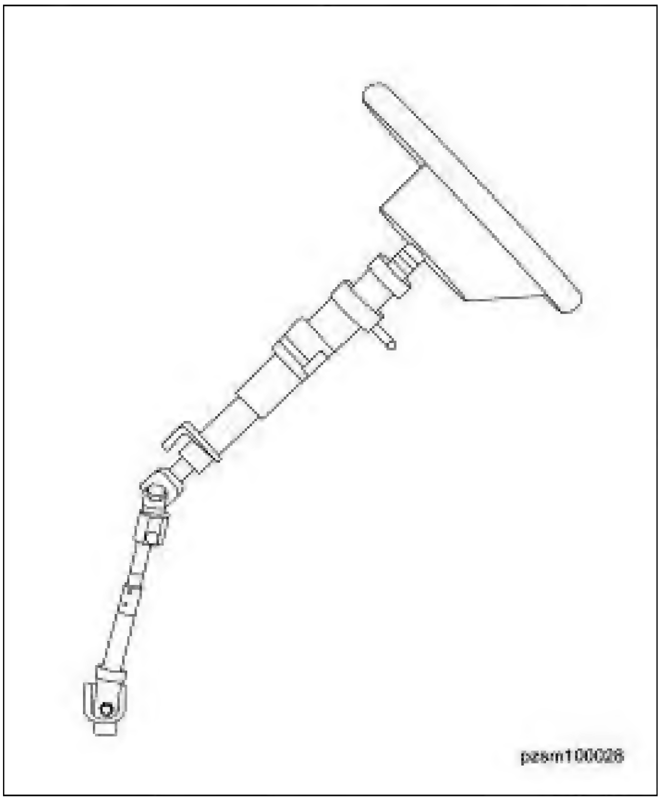
GENERAL INFORMATION

Description

The steering column has been designed so that the wiring, switches, shrouds and steering wheel can be serviced without removing the steering column from the vehicle.

Operation

The steering column is the mechanical linkage between the steering wheel and the steering gear. The steering column shaft then connects the steering column to the steering gear. The tilt function of the steering column is controlled by a mechanical lever on the underside of the steering column, which uses a cam to lock and unlock the steering column.

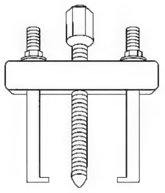


Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Steering column shroud upper bolt	4 ± 2
Steering column shroud lower bolt	5 ± 2
Steering Wheel Lock Nut	30 ± 3

Special Tools

Steering Wheel Puller	 besm110015

DIAGNOSIS & TESTING

Vehicle Inspection

There is some noise in all power steering systems. One of the most common is a hissing sound. Hiss is a high frequency noise similar to that of a water tap being closed slowly. The noise is present in all valves that have a high velocity fluid passing through an orifice. There is no relationship between this noise and steering performance. The hissing sound is commonly heard during the following operations:

- Evident at a standstill
- At park with the engine running
- When the steering wheel is at the end of its travel

Loose Steering / Vehicle Leads / Drifts Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Excessive Play In Steering Wheel	· Worn or loose suspension or steering components. · Worn or loose wheel bearings. · Steering gear mounting. · Gear out of adjustment. · Worn or loose steering coupler.	· Repair if necessary. · Repair if necessary. · Tighten gear mounting bolts to specification. · Adjust gear to specification. · Repair if necessary.
Vehicle Pulls To One Side During Braking	· Tire pressure. · Air in brake hydraulics system. · Worn brake components.	· Adjust tire pressure. · Bleed brake system. · Repair if necessary.
Vehicle Leads Or Drifts From Straight Ahead Direction On Uncrowned Road.	· Tire pressure. · Radial tire lead. · Brakes dragging. · Wheel alignment. · Weak or broken spring. · Loose or worn steering/suspension components.	· Adjust tire pressure. · Cross front tires. · Repair if necessary. · Align vehicle. · Replace spring. · Repair if necessary.

ON-VEHICLE SERVICE

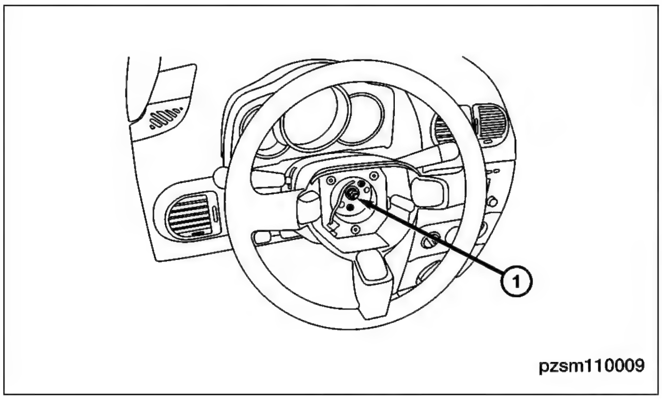
Steering Wheel

Removal & Installation

WARNING!
Before servicing the steering column, the airbag system must be disarmed. Failure to do so may result in accidental deployment of the airbag and possible personal injury (See Airbag System Disarming Procedure in Section 14 Restraints).

NOTE :
To help maintain alignment of the spiral cable connector during reassembly, apply a small piece of tape to the spiral cable and the steering column to keep them in alignment.

1. Set the front wheels to the straight-ahead position.
2. Disconnect the negative battery cable.
3. Remove the driver airbag (See Driver Airbag Removal & Installation in Section 14 Restraints).
4. Disconnect the spiral cable electrical connector.
5. Remove the steering wheel lock nut (1).
   (Tighten: Steering wheel lock nut to 30 ± 3 N·m)



6. Using the steering wheel puller, remove the steering wheel.
7. Installation is in the reverse order of removal.

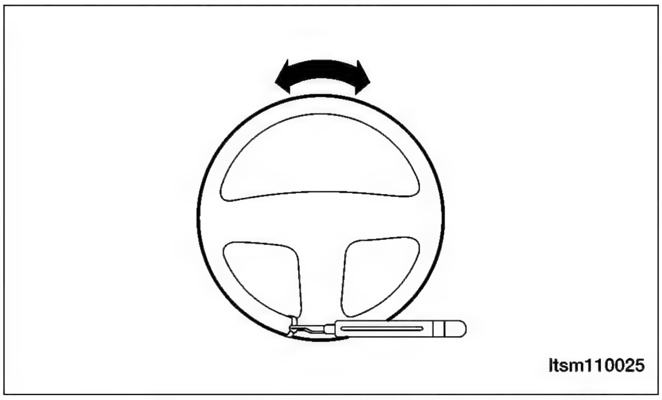
Installation Notes:

- The spiral cable could be damaged if installed in an improper position.
- Do not rotate the spiral cable quickly or beyond the limit of turns (this can cause the cable to snap).
- Verify the airbag system is operating properly after the repair is complete.

Inspection - Steering System

Steering Wheel Free-Play Inspection

- Set the front wheels to the straight-ahead position with the engine idling (hydraulic system is working).
- Slightly turn steering wheel to the right and left, and before the wheels begin turning, measure the free play of steering wheel.
  - Maximum limit: 40 mm.



- If the free play exceeds the limit value, inspect the gap between the steering shaft joint and the steering linkage. Repair or replace the related parts as necessary. If the free play still exceeds the limit value, turn the steering wheel to the right position with the engine off. Apply 5 N·m of load to the steering wheel and inspect the free-play again.
  - Standard value: Less than 15 mm (steering wheel free play with the engine off)
- If free play exceeds standard value, remove steering gear housing and inspect the gross torque of pinion gear.

Static Steering Force Inspection

- Park the vehicle on a level surface, and turn the steering wheel to the straight-ahead position. Start the engine, adjust engine speed to 1000 ± 100 RPM.

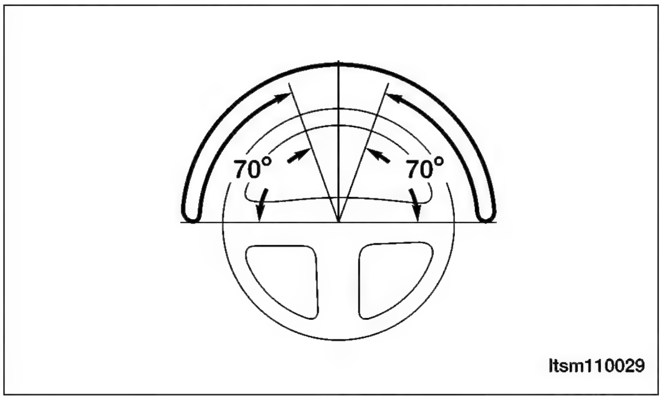
CAUTION:
After adjusting the engine speed, return it back to standard idle speed.

- Connect a spring scale to the outer circle of steering wheel. Measure the steering force required when turning the steering wheel leftward and rightward (within 1.5 circles) at the straight-ahead position. If obvious steering force fluctuation exists, inspect the steering force as necessary.
  - Standard steering force: Less than 34 N·m
  - Fluctuation tolerance: Less than 5.9 N·m
- If the measured force exceeds the standard value, see the trouble shooting section for inspection and adjustment.

Steering Wheel Return to Center Inspection

NOTE :
This test should be performed during a road test.

- Make smooth turns and sharp turns. Check the driving ″sense″ to ensure there is no difference between the left and right turns in terms of steering force and the steering wheel returning to center.
- When the vehicle speed is between 20 to 30 km/h turn the steering wheel 90° for 1 or 2 seconds and release the steering wheel. If the steering wheel returns over 70°, the steering wheel return function can be considered good.

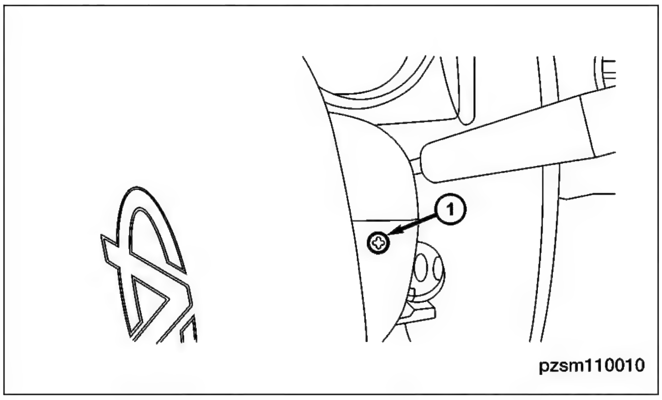


NOTE :
When rapidly turning the steering wheel, there will be a sense of “heavy”, however, this does not indicate a problem with the steering system, this is due to insufficient steering fluid supplied to the steering fluid pump during idle speed.

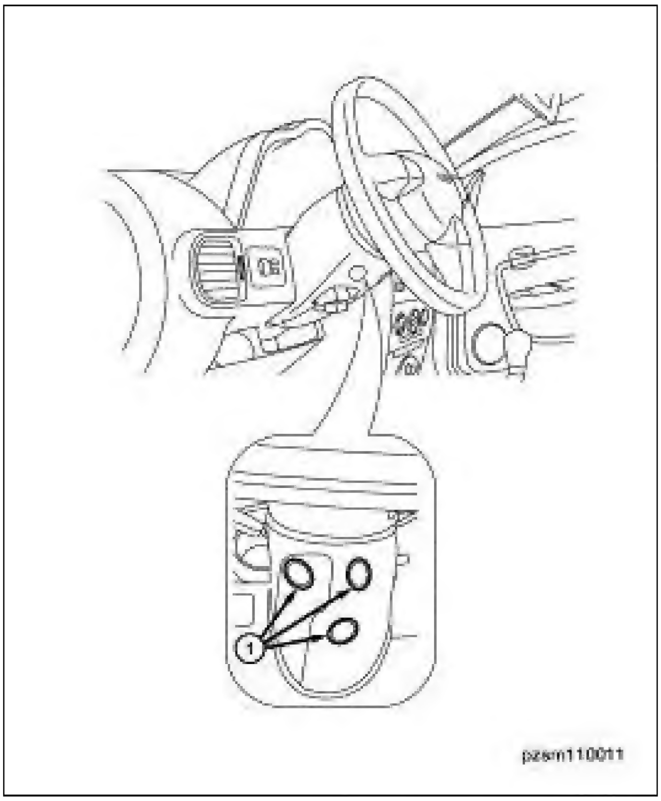
Steering Column Shroud

Removal & Installation

1. Turn the steering wheel until it show the steering column upper shroud retaining bolt.
2. Remove the steering column upper shroud retaining bolt (1).
   (Tighten: Steering column upper shroud retaining bolt to 4 ± 2 N·m)



3. Remove the three steering column lower shroud retaining bolts (1).
   (Tighten: Steering column lower shroud retaining bolts to 5 ± 2 N·m)



4. Remove the shroud.
5. Installation is in the reverse order of removal.

Installation Notes:

- The spiral cable could be damaged if installed in an improper position.
- Do not rotate the spiral cable quickly or beyond the limit of turns (this can cause the cable to break).
- Verify the airbag system is operating properly after the repair is complete.

Steering Column

Removal & Installation

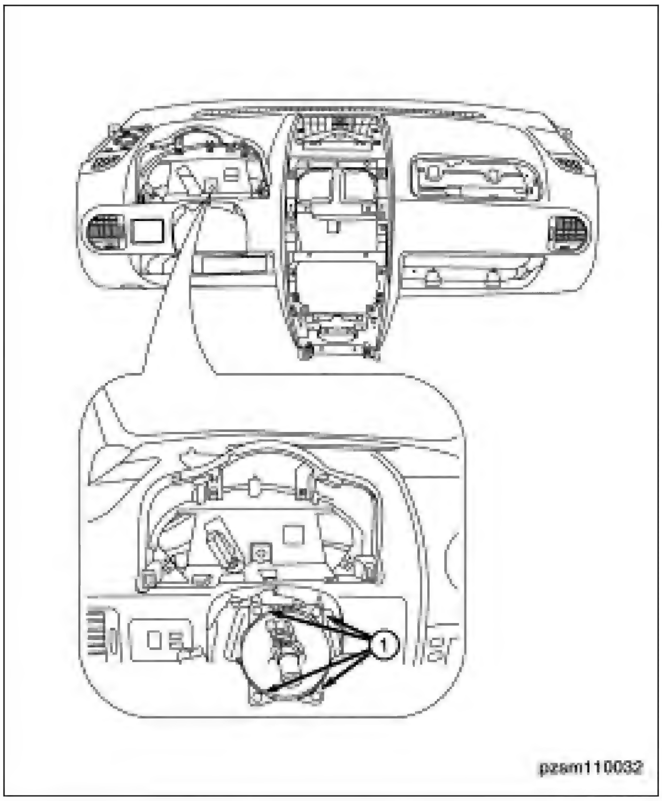
WARNING!

Before servicing the steering column, the airbag system must be disarmed. Failure to do so may result in accidental deployment of the airbag and possible personal injury (See Airbag System Disarming Procedure in Section 14 Restraints).

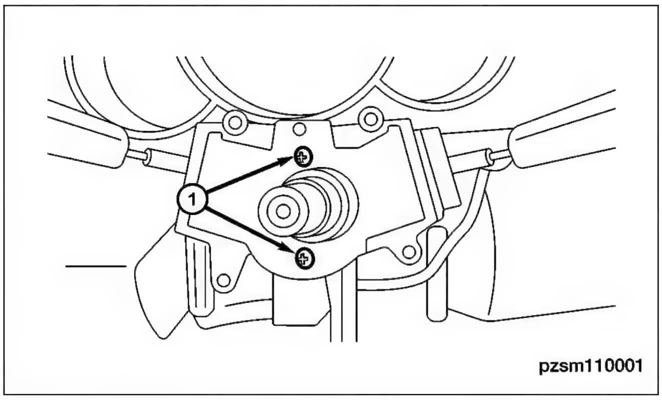
NOTE :
To help maintain alignment of the spiral cable connector during reassembly, apply a small piece of tape to the spiral cable and the steering column to keep them in alignment.

1. Disconnect the negative battery cable.
2. Set the front wheels to straight-ahead position.
3. Remove the driver airbag (See Driver Airbag Removal & Installation in Section 14 Restraints).
4. Disconnect the spiral cable electrical connector.
5. Remove the steering wheel (See Steering Wheel Removal & Installation in Section 11 Steering).
6. Remove the steering shroud (See Steering Shroud Removal & Installation in Section 11 Steering).

7. Remove the four spiral cable retaining bolts (1). (Tighten: Spiral cable retaining bolts to 7 ± 2 N·m)

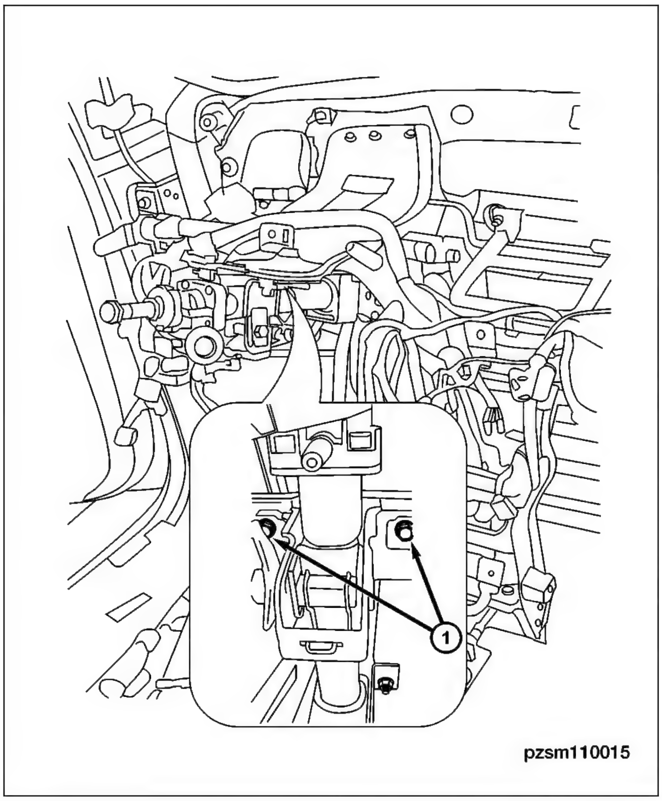


8. Disconnect the multi-function switch & wiper and washer switch assembly electrical connector.
9. Remove the two multi-function switch & wiper and washer switch assembly retaining bolts (1). (Tighten: Multi-function switch & wiper and washer switch assembly bolts to 7 ± 2 N·m)

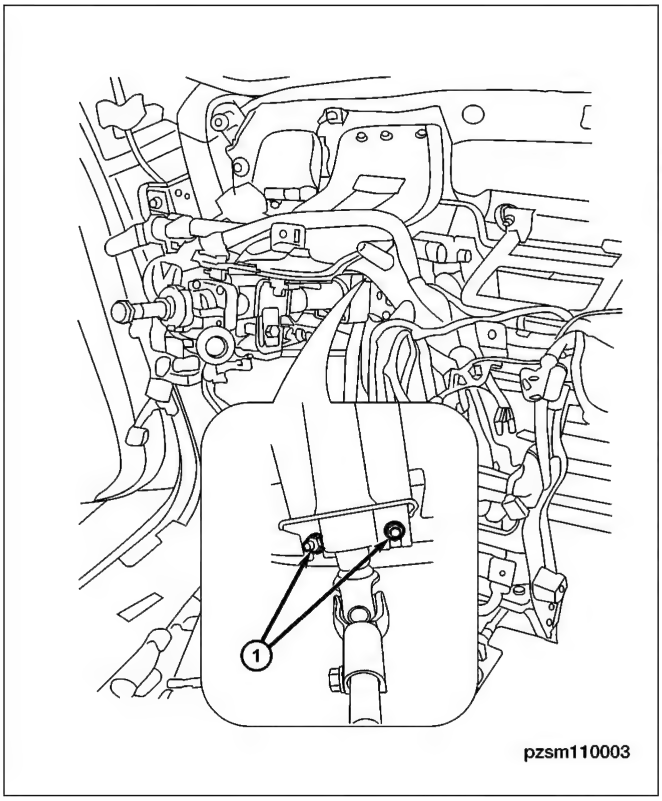


10. Remove the multi-function switch & wiper and washer switch assembly.
11. Disconnect the ignition switch electrical connector.

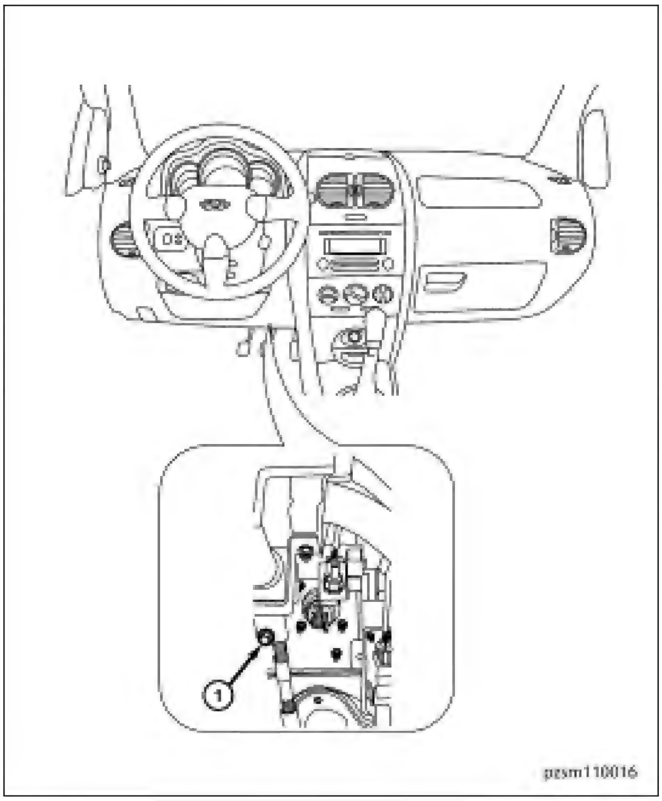
12. Remove the two upper mounting bolts (1) from the steering column.
    (Tighten: Steering column upper mounting bolts to 25 ± 3 N·m)



13. Remove the two lower mounting bolts (1) from the steering column.
    (Tighten: Steering column lower mounting bolts to 25 ± 3 N·m)



14. Remove the intermediate shaft lock bolt (1) from the steering gear.
    (Tighten: Intermediate shaft lock bolt to 25 ± 3 N·m)



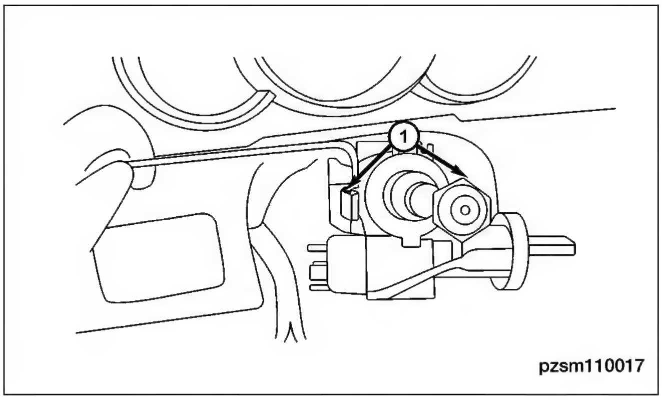
15. Remove the steering column assembly.
16. Installation is in the reverse order of removal.

Installation Notes:

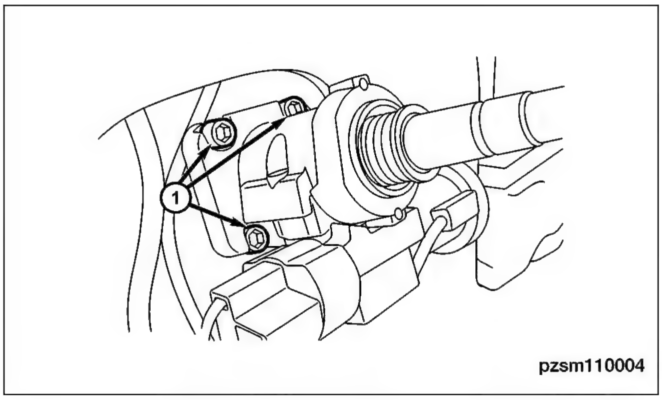
- Check the steering shaft and universal joint for damage or wear. Check the clearance of universal joint, and replace if necessary.
- Check the steering column seal cover. The distance to the groove button should be less than 1.00 mm, replace if necessary.
- Verify the airbag system is operating properly after the repair is complete.
- When installing the spiral cable, slowly wind the spiral cable to the end of its travel and then unwind the spiral cable two and a half turns.

Disassembly

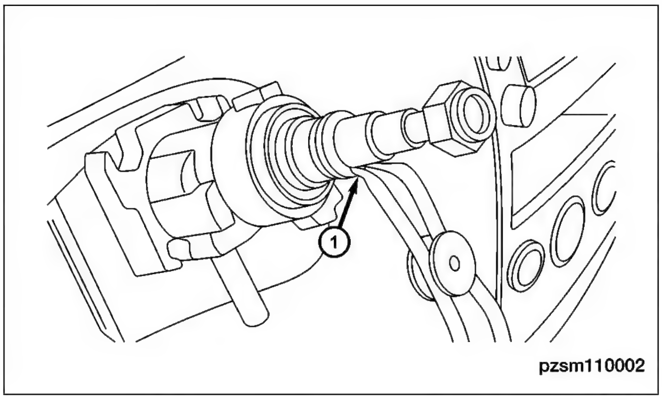
1. Remove the two ignition switch retaining bolts (1) with inner hex wrench.



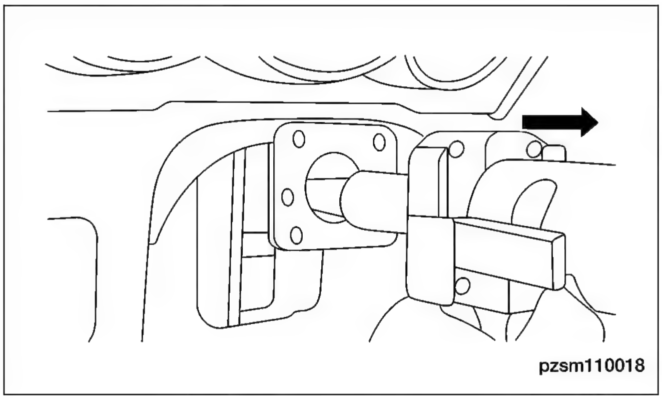
2. Remove the four upper end cap bolts from the steering column retaining bolts (1) with inner hex wrench.
   (Tighten: Upper end cap bolts to 12 ± 2 N·m)



3. Using snap-ring pliers, remove the outer snap ring (1).



4. Remove the retainer and spring.
5. Remove the upper end cap of steering column.



6. Assembly is in the reverse order of disassembly.

STEERING GEAR

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GENERAL INFORMATION

Description

The steering gear used is the rack-and-pinion type with power assist. It is mounted on the front suspension sub-frame. The outer ends of the outer tie rods attach to the front knuckles.

NOTE :
The power steering gear should not be serviced or adjusted. If a malfunction or oil leak occurs with the steering gear, the complete steering gear needs to be replaced.

Operation

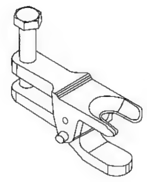
The steering wheel turns the pinion. The rack is a long flat bar with teeth on one side. The rack teeth mesh with the teeth on the pinion. Rotation of the pinion moves the rack from left to right and right to left. The tie rod then causes the wheels to turn to the left or right.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Inlet / Outlet Pipe Nut	25 ± 5
Intermediate Shaft Bolt	25 ± 3
Steering Gear to Sub-Frame Bolts	100 ± 10
Sub-Frame Assembly Bolts	180 ± 15
Tie Rod End Nut	40 ± 5
Tie Rod Jam Nut	35 ± 3
Wheel Mounting Nuts	110

Special Tools

Ball Joint Separator CH-10002	 besm020086

DIAGNOSIS & TESTING

Binding and Sticking Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Difficult To Turn Wheel Sticks Or Binds	· Low fluid level. · Tire pressure. · Steering component. · Loose belt. · Low pump pressure. · Column shaft coupler binding. · Steering gear worn or out of adjustment. · Ball joints binding. · Belt routing.	· Fill to proper level. · Adjust tire pressure. · Inspect and lube. · Adjust or replace. · Pressure test and replace if necessary. · Replace coupler. · Repair or replace gear. · Inspect and repair if necessary. · Verify belt routing is correct.

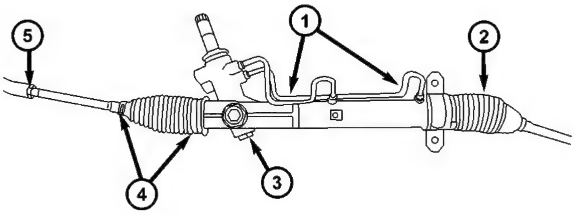
Insufficient Assist / Poor Return To Center Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Hard Turning Or Momentary Increase In Turning Effort	· Tire pressure. · Low fluid level. · Loose belt. · Lack of lubrication. · Low pump pressure or flow. · Internal gear leak. · Belt routing.	· Adjust tire pressure. · Fill to proper level. · Adjust or replace. · Inspect and lubricate steering and suspension components. · Pressure and flow test and repair if necessary. · Pressure and flow test, and repair if necessary. · Verify belt routing is correct.
Steering Wheel Does Not Want To Return To Center Position	· Tire pressure. · Wheel alignment. · Lack of lubrication. · High friction in steering gear. · Ball joints binding.	· Adjust tire pressure. · Align front end. · Inspect and lubricate steering and suspension components. · Test and adjust if necessary. · Inspect and repair if necessary.

ON-VEHICLE SERVICE

Steering Gear - LHD

Removal & Installation



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1 - Steering Gear Inlet/Outlet Pipe	4 - Clamp
2 - Dust Boot	5 - Tie Rod Lock Nut
3 - Steering Gear Lock Nut	

NOTE :
The following special tools are required to perform the repair procedure:

- CH-10002 - Ball Joint Separator

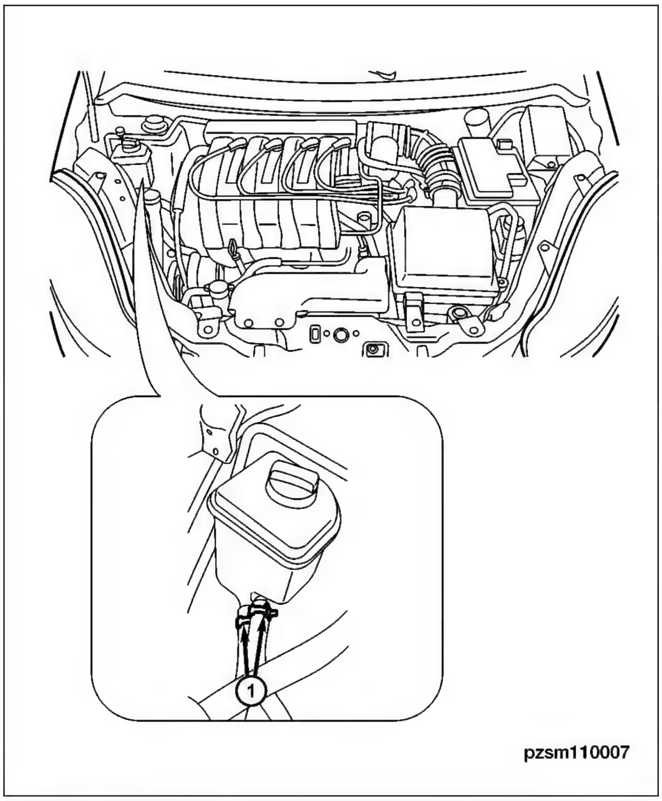
1. Siphon out as much power steering fluid as possible from the reservoir.

WARNING!

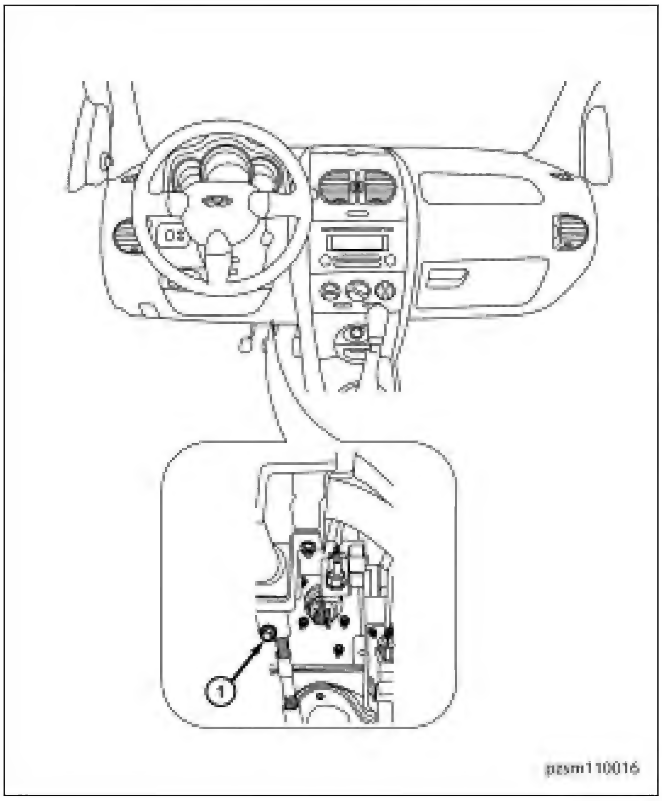
Prolonged and repeated contact with power steering fluid will damage skin. If steering fluid is spilled on your skin, wash it off immediately with water.

2. Raise and support the vehicle.
3. Remove the front wheel mounting nuts and the wheel assemblies from both sides.
(Tighten: Wheel mounting nuts to 110 N·m)

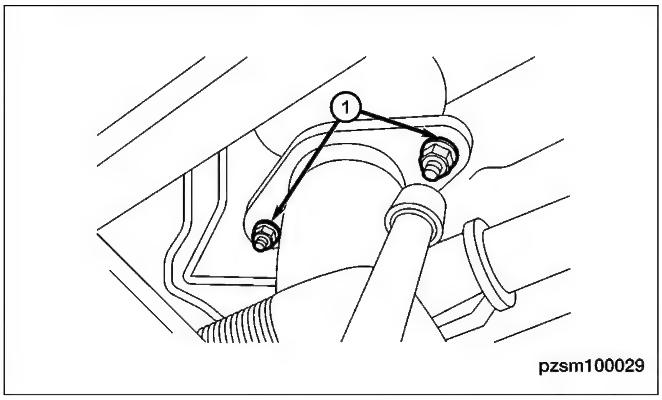
4. Remove the return hose clamps (1) from the power steering fluid reservoir and insert the end of the hose into a container.



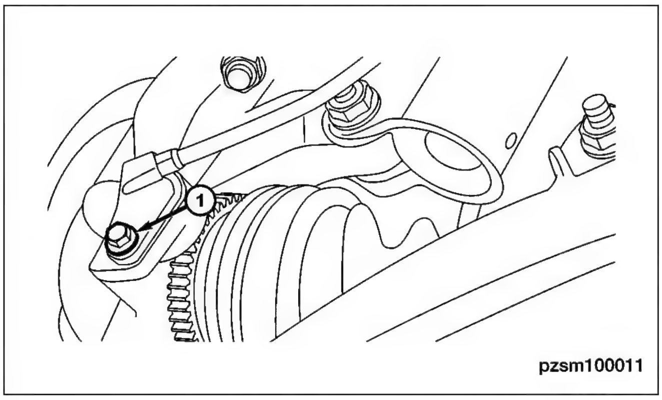
5. Start the engine and turn the steering wheel from lock-to-lock until all power steering fluid has been removed from the system.
6. Stop the engine.
7. Use a service jack to support the engine.
8. Remove the intermediate shaft coupling bolt (1) at the steering gear.
   (Tighten: Intermediate shaft coupling bolt to 25 ± 5 N·m)



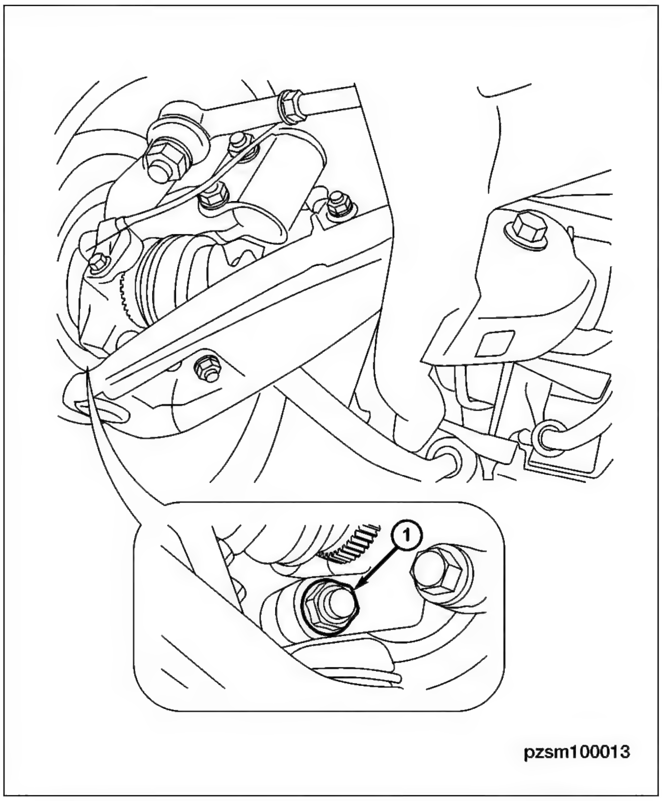
9. Raise the vehicle.
10. Remove the front exhaust pipe retaining bolts (1). (Tighten: Front exhaust pipe retaining bolts to 50 ± 5 N·m)



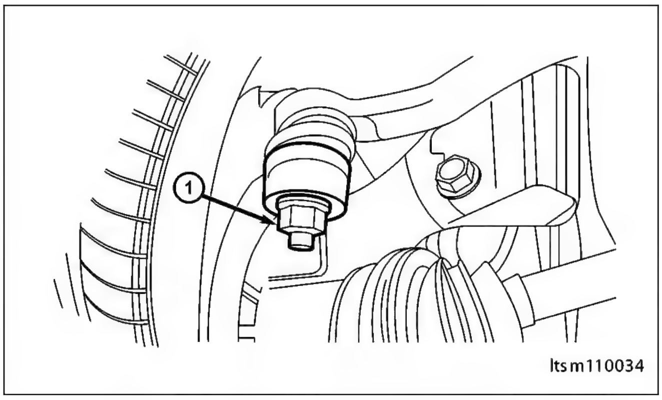
11. Remove the exhaust pipe (See Exhaust Pipe Removal & Installation in Section 07 Exhaust).
12. Remove the vehicle speed sensor retaining bolt (1) and set it aside.
    (Tighten: Vehicle speed sensor bolt to 10 ± 1 N·m)



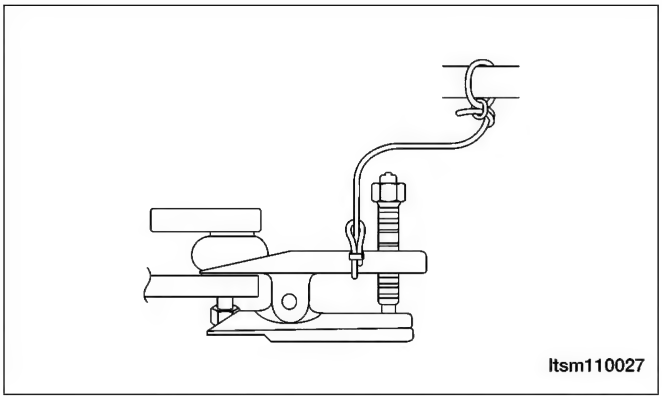
13. Remove the pinch bolt (1) from the steering knuckle.
    (Tighten: Steering knuckle pinch bolt to 110 N·m)



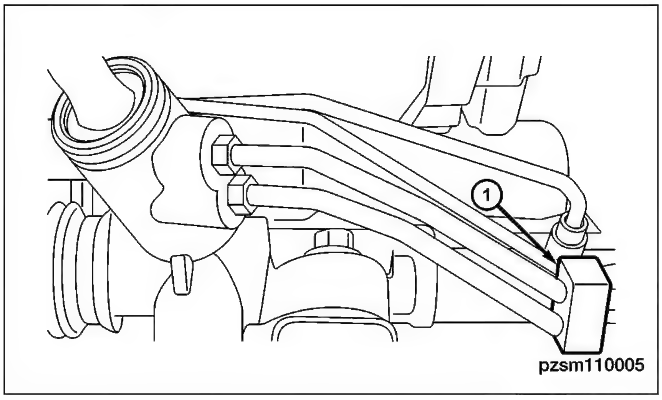
14. On each side of the steering gear, remove the nut (1) attaching the outer tie rod end to the steering knuckle.
    (Tighten: Outer tie rod end nut to 40 ± 5 N·m)



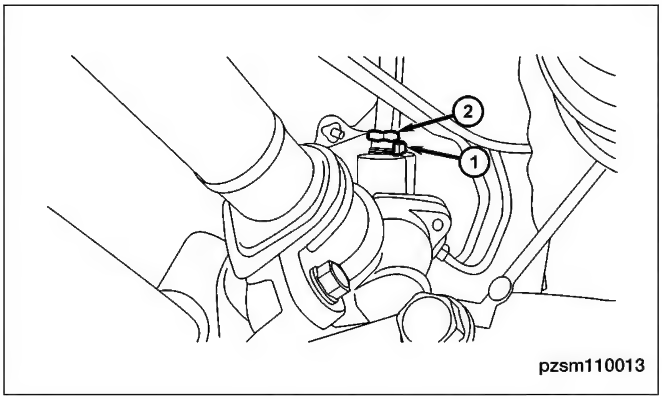
15. Using special tool CH-10002, separate the outer tie rod ends from both steering knuckles.



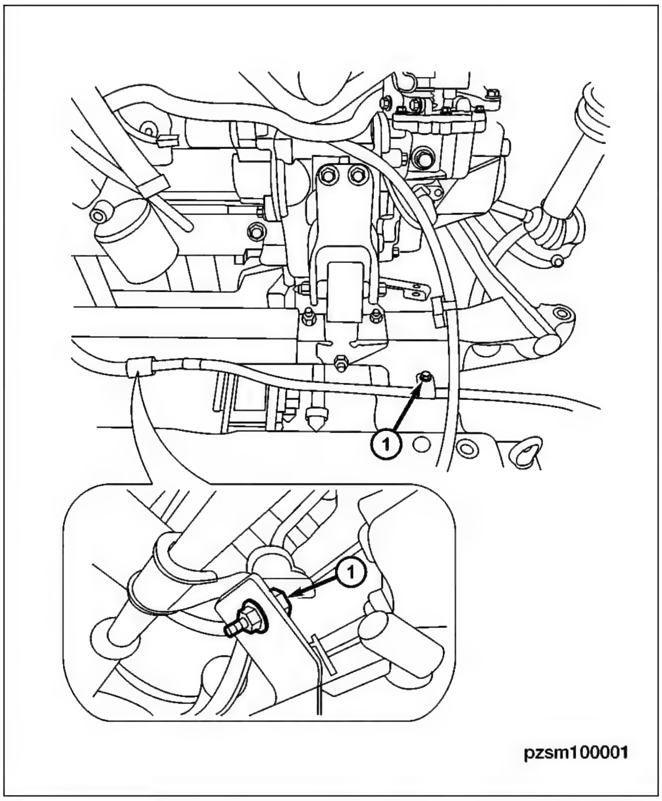
16. Remove the steering gear pressure lines clamp (1).



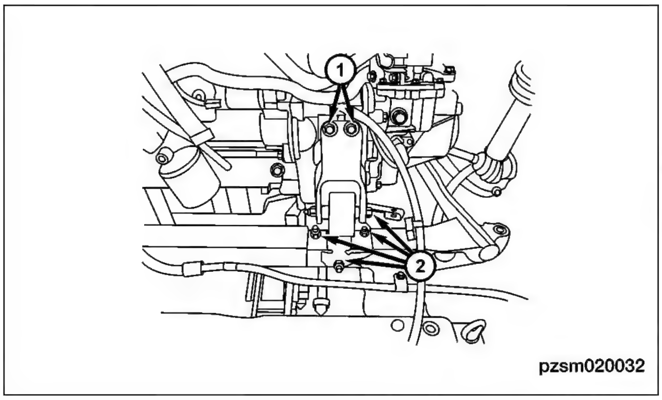
17. Remove the high pressure line nut (2) and the low pressure line nut (1) from the steering gear.
    (Tighten: High pressure line nut to steering gear 25 ± 5 N·m)
    (Tighten: Low pressure line nut to steering gear 25 ± 5 N·m)



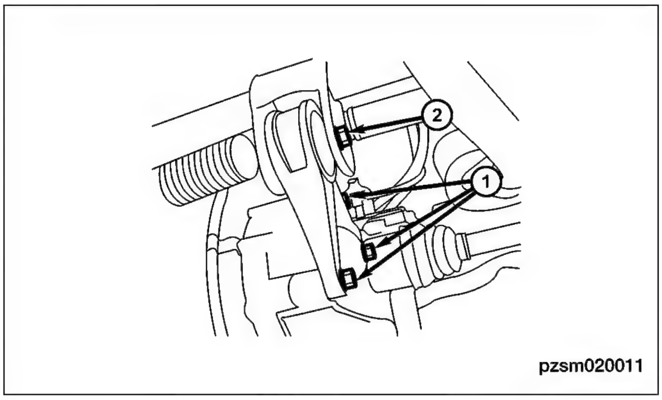
18. Remove the A/C pipe bracket retaining bolt (1) on the sub-frame (See Suction Line Removal & Installation in Section 13 Heating & Air Conditioning).



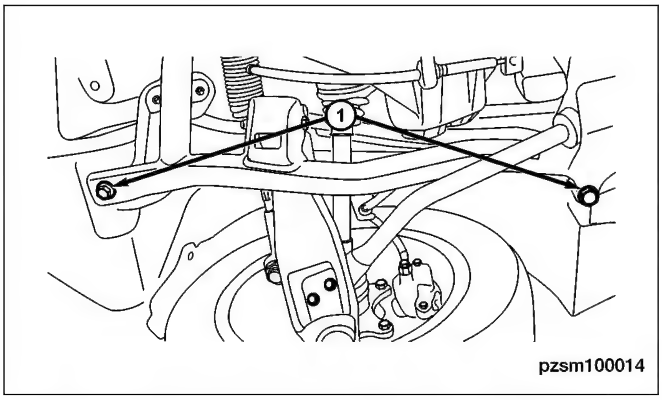
19. Remove the front engine mount bolts (1) and the front engine mount bracket bolts (2).
(Tighten: Front engine mount bolt to 80 ± 5 N·m)



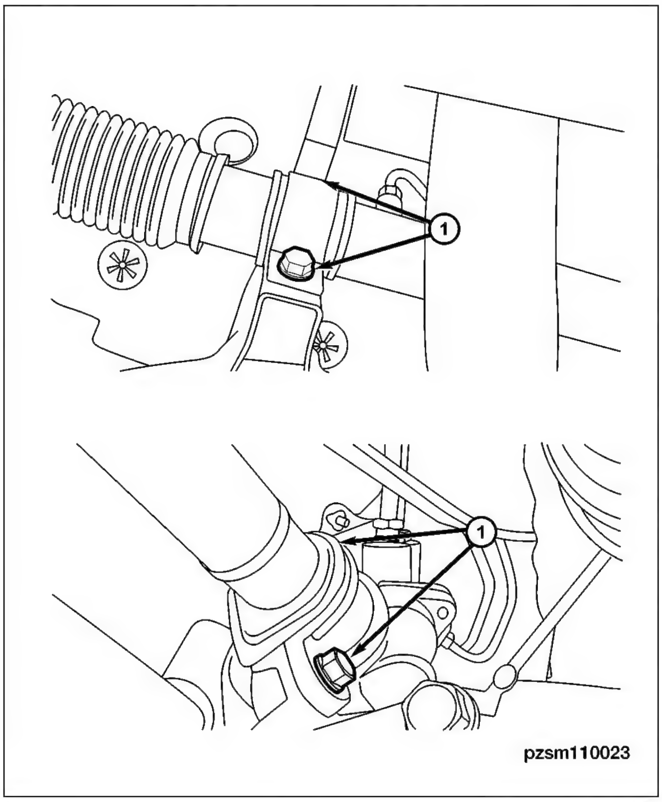
20. Remove the rear engine mount bolts (1) and the rear engine mount bracket bolt (2).
(Tighten: Rear engine mount bolts to 60 ± 5 N·m)



21. Remove the sub-frame mounting bolts (1) (4 total) between the sub-frame assembly and the vehicle body.
    (Tighten: Sub-frame mounting bolts to 150 ± 10 N·m)



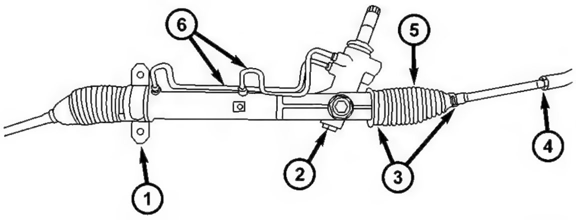
22. Using a service jack, slowly lower the sub-frame enough to access the intermediate shaft coupling at the steering gear pinion shaft.
23. Remove the steering gear retaining bolts (1).
    (Tighten: Steering gear retaining bolts to 100 ± 10 N·m)



24. Remove the steering gear assembly.
25. Installation is in the reverse order of the removal.

Steering Gear - RHD

Removal & Installation



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1 - Steering Gear Bracket	4 - Tie Rod Lock Nut
2 - Steering Gear Lock Nut	5 - Dust Boot
3 - Dust Boot Clamps	6 - Steering Gear Inlet/Outlet Pipe

NOTE :
The following special tools are required to perform the repair procedure:

- CH-10002 - Ball Joint Separator

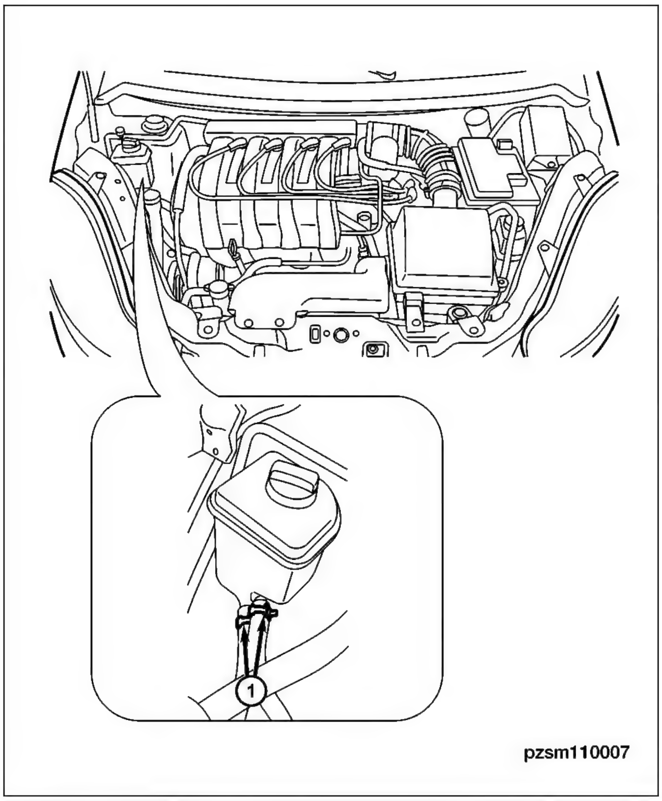
1. Siphon out as much power steering fluid as possible from the reservoir.

WARNING!

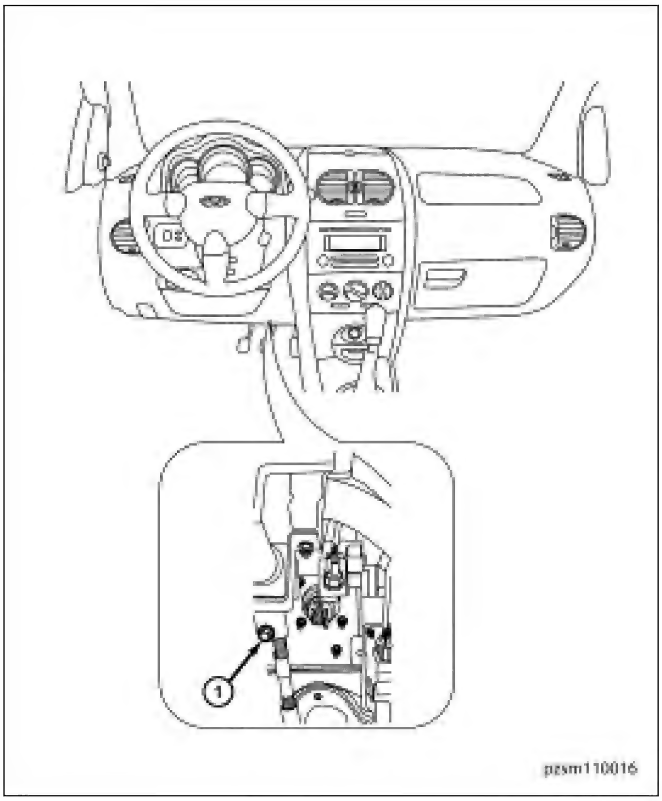
Prolonged and repeated contact with power steering fluid will damage skin. If steering fluid is spilled on your skin, wash it off immediately with water.

2. Raise and support the vehicle.
3. Remove the front wheel mounting nuts and the wheel assemblies from both sides.
   (Tighten: Wheel mounting nuts to 110 N·m)

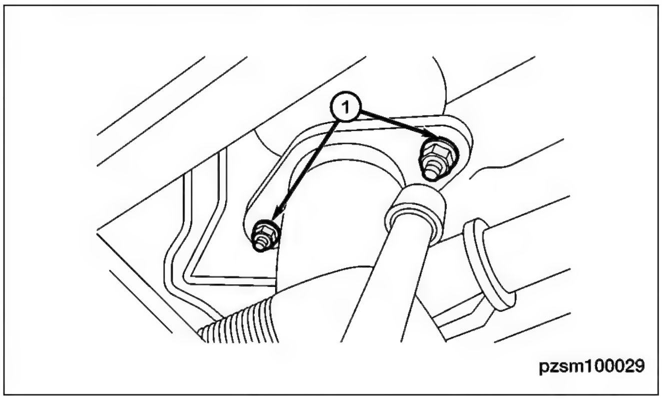
4. Remove the return hose clamps (1) from the power steering fluid reservoir and insert the end of the hose into a container.



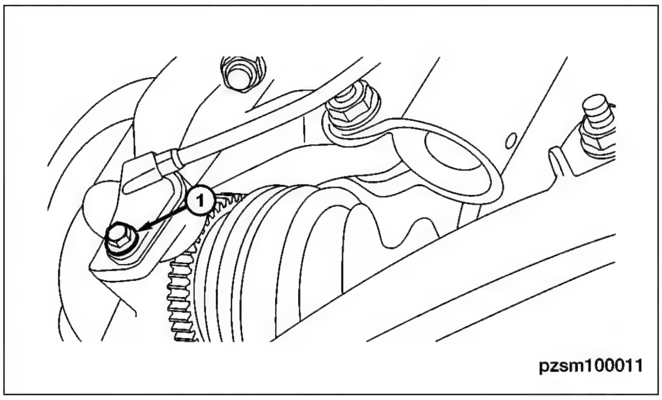
5. Start the engine and turn the steering wheel from lock-to-lock until all power steering fluid has been removed from the system.
6. Stop the engine.
7. Use a service jack to support the engine.
8. Remove the intermediate shaft coupling bolt (1) at the steering gear.
   (Tighten: Intermediate shaft coupling bolt to 25 ± 5 N·m)



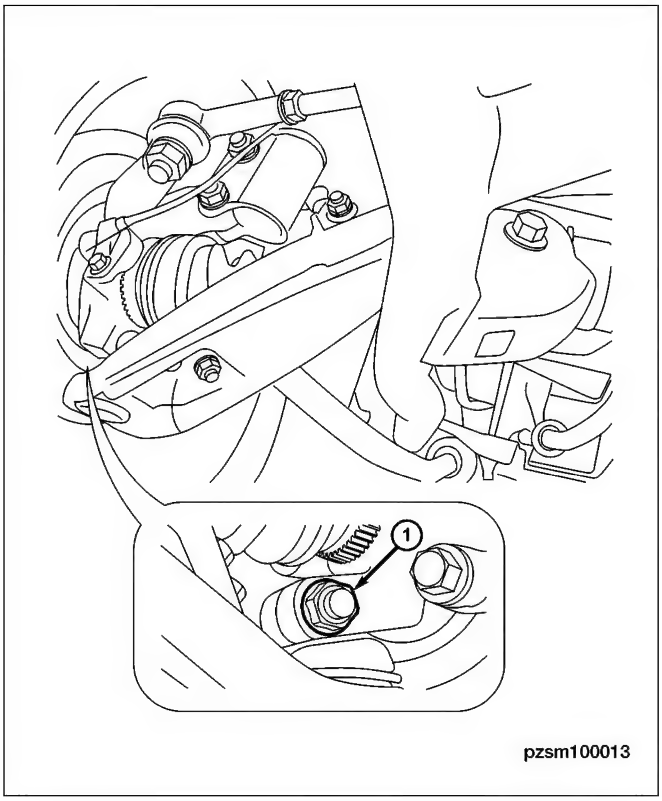
9. Raise the vehicle.
10. Remove the front exhaust pipe retaining bolts (1). (Tighten: Front exhaust pipe retaining bolts to 50 ± 5 N·m)



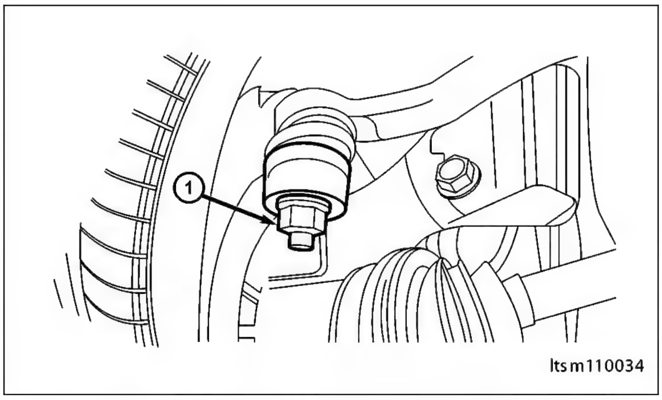
11. Remove the exhaust pipe (See Exhaust Pipe Removal & Installation in Section 07 Exhaust).
12. Remove the vehicle speed sensor retaining bolt (1) and set it aside.
    (Tighten: Vehicle speed sensor bolt to 10 ± 1 N·m)



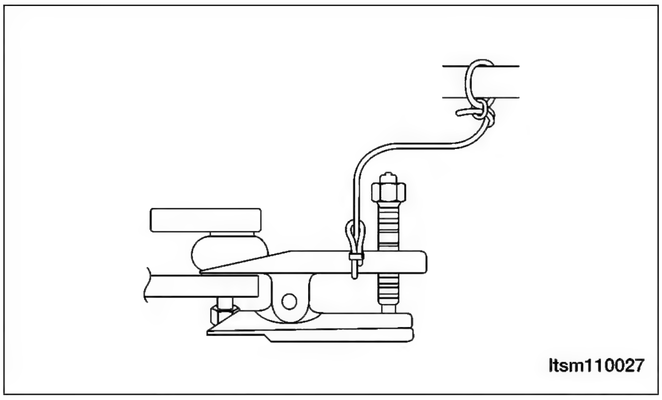
13. Remove the pinch bolt (1) from the steering knuckle.
    (Tighten: Steering knuckle pinch bolt to 110 N·m)



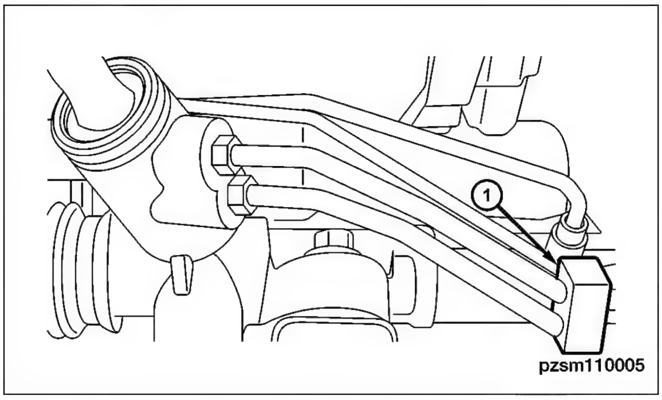
14. On each side of the steering gear, remove the nut (1) attaching the outer tie rod end to the steering knuckle.
    (Tighten: Outer tie rod end nut to 40 ± 5 N·m)



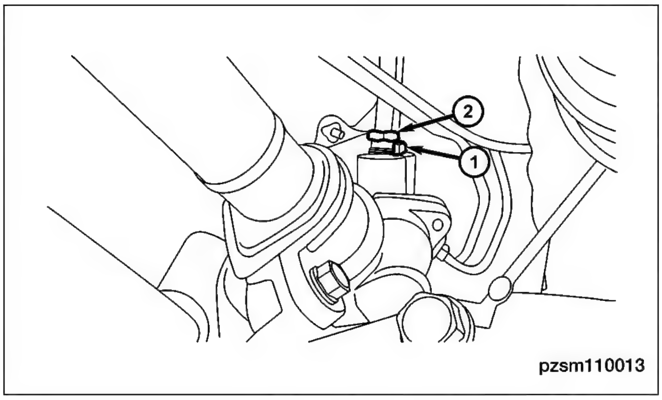
15. Using special tool CH-10002, separate the outer tie rod ends from both steering knuckles.



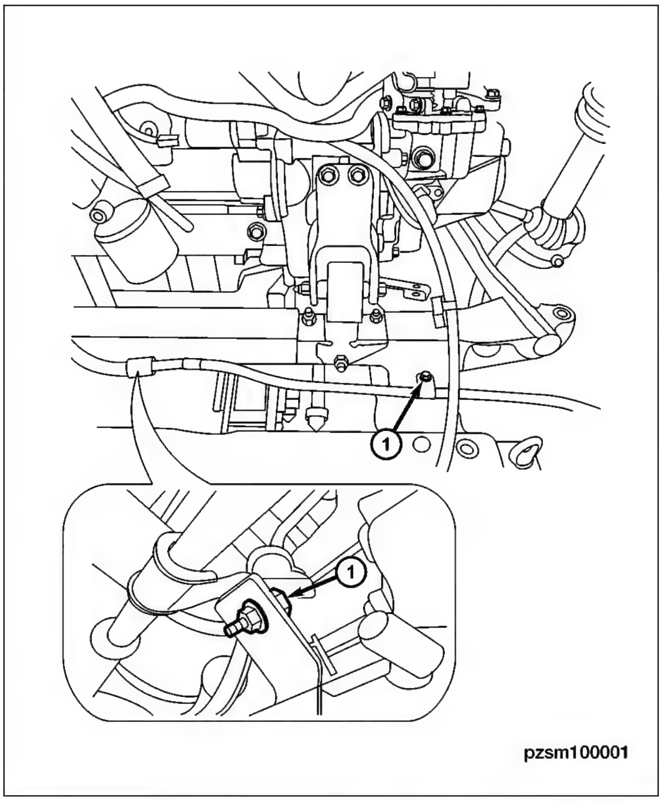
16. Remove the steering gear pressure lines clamp (1).



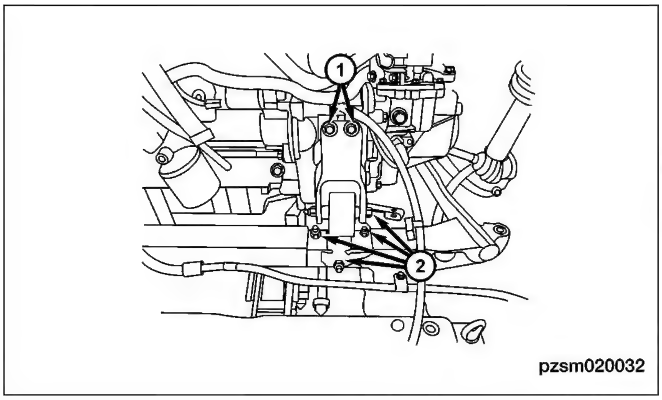
17. Remove the high pressure line nut (2) and the low pressure line nut (1) from the steering gear.
    (Tighten: High pressure line nut to steering gear 25 ± 5 N·m)
    (Tighten: Low pressure line nut to steering gear 25 ± 5 N·m)



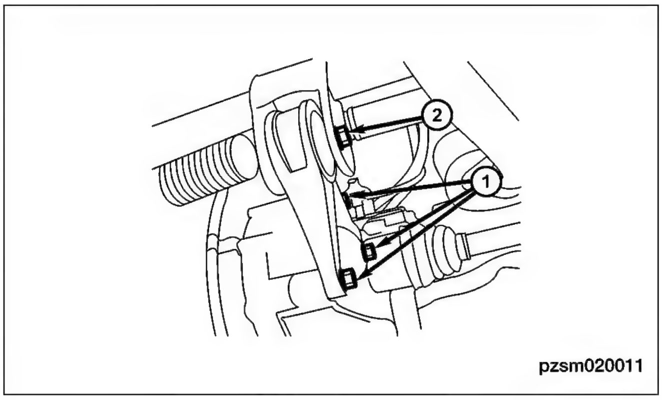
18. Remove the A/C pipe bracket retaining bolt (1) on the sub-frame (See Suction Line Removal & Installation in Section 13 Heating & Air Conditioning).



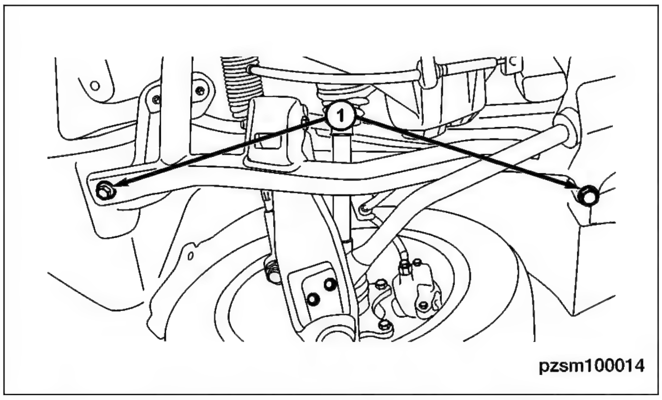
19. Remove the front engine mount bolts (1) and the front engine mount bracket bolts (2).
(Tighten: Front engine mount bolt to 80 ± 5 N·m)



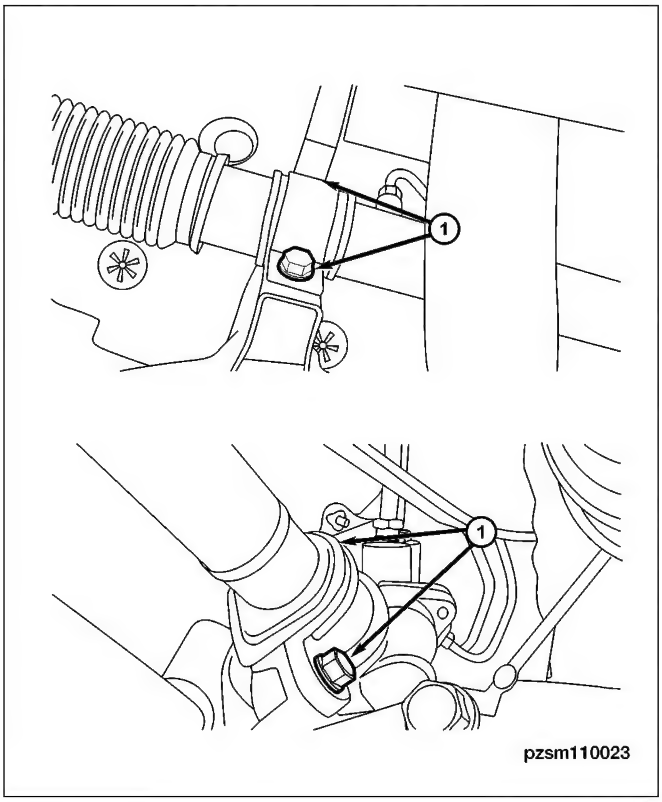
20. Remove the rear engine mount bolts (1) and the rear engine mount bracket bolt (2).
(Tighten: Rear engine mount bolts to 60 ± 5 N·m)



21. Remove the sub-frame mounting bolts (1) (4 total) between the sub-frame assembly and the vehicle body.
    (Tighten: Sub-frame mounting bolts to 150 ± 10 N·m)



22. Using a service jack, slowly lower the sub-frame enough to access the intermediate shaft coupling at the steering gear pinion shaft.
23. Remove the steering gear retaining bolts (1).
    (Tighten: Steering gear retaining bolts to 100 ± 10 N·m)



24. Remove the steering gear assembly.
25. Installation is in the reverse order of the removal.

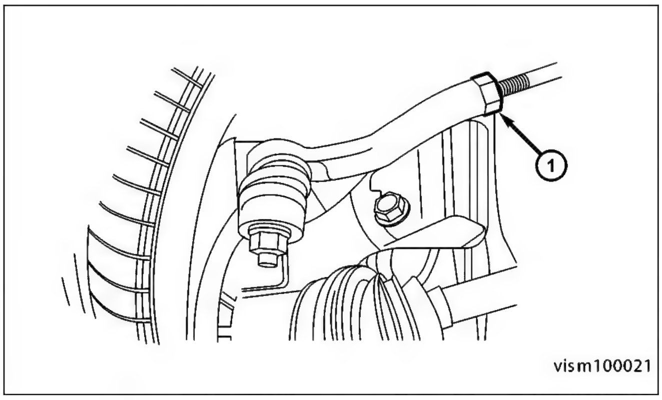
Tie Rod

Removal & Installation

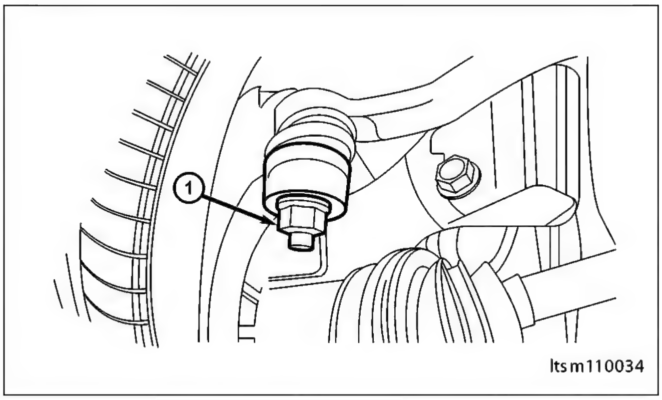
NOTE :
The following special tools are required to perform the repair procedure:
- CH-10002 - Ball Joint Separator

1. Raise and support the vehicle.
2. Remove the front wheel mounting nuts and the wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)

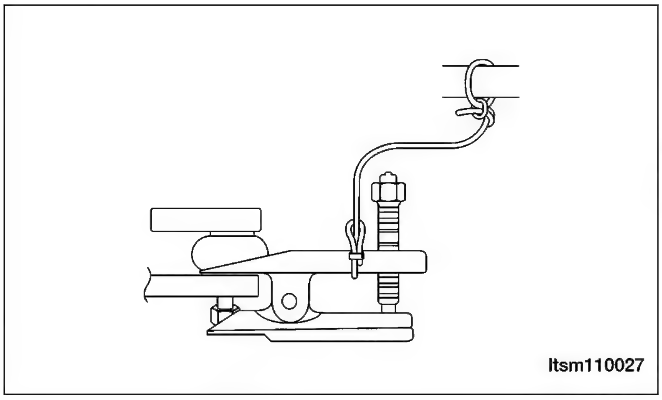
3. Loosen the tie rod jam nut (1).
   (Tighten: Tie rod jam nut to 35 ± 3 N·m)



4. Remove the nut (1) attaching the outer tie rod end to the steering knuckle.
   (Tighten: Outer tie rod end nut to 40 ± 5 N·m)



5. Using special tool CH-10002, separate the outer tie rod end from the steering knuckle.



6. Remove the outer tie rod end from the steering rack.

NOTE :
When removing the outer tie rod end, count the number of revolutions when removing. This will aid in installation, getting the toe setting close to where it needs to be when setting the final toe-in wheel alignment.

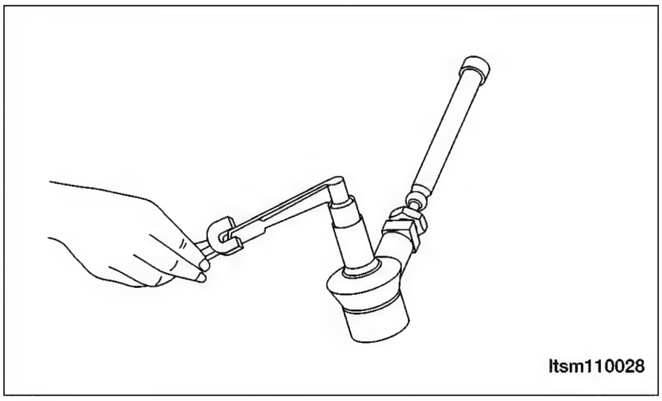
7. Installation is in the reverse order of removal.

Installation Notes:

- After installing the new tie rod end, perform a front end alignment procedure to reset the toe-in (See Front Wheel Alignment in Section 10 Suspension).

Inspection

1. When the starting torque exceeds the standard value, replace the steering tie rod end.
   - Standard value: 0.98-3.92 N·m
2. When the starting torque is less than the standard value, inspect the ball joint for excessive play or wear problem. If there is no problem found, the ball joint can be used.



POWER STEERING PUMP

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GENERAL INFORMATION

Description

The power steering pump is a constant flow rate and displacement vane type pump. The pump reservoir is detached from the pump body. The pump is connected to the steering gear by the pressure and return lines.

Operation

The power steering pump is mounted to the engine and driven by the engine accessory drive belt. Power steering fluid enters the pump from the reservoir. The power steering fluid is then trapped between the pump vanes and moved to the high-pressure side of the pump creating a flow of fluid. The restriction of this flow by the steering gear creates the pressure that provides the steering assist.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Power Steering Pressure Line To Steering Gear	25 ± 5
Power Steering Return Line To Steering Gear	25 ± 5
Power Steering Pressure Line To Power Steering Pump	45 ± 5
Power Steering Pump Mounting Bolts	25 ± 5
Pressure/Return Hose Routing Clamp Screws To Cross Member	10

Fluid Specifications

DESCRIPTION	CAPACITY (L)
Power Steering Fluid (ATF III)	1.0

DIAGNOSIS & TESTING

Steering System Noise Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Hiss Or Whistle Sound When Turning Steering Wheel	· Steering intermediate shaft to dash panel seal. · Noisy valve in power steering gear.	· Check and repair seal at dash panel. · Replace steering gear.
Rattle Or Clunk	· Gear mounting bolts loose. · Loose or damaged suspension components. · Loose or damaged steering linkage. · Internal gear noise. · Pressure hose in contact with other components.	· Tighten bolts to specification. · Inspect and repair suspension. · Inspect and repair steering linkage. · Replace gear. · Reposition hose.
Chirp Or Squeal	· Loose belt. · Belt routing.	· Adjust or replace. · Verify belt routing is correct.
Whine Or Growl	· Low fluid level. · Pressure hose in contact with other components. · Internal pump noise. · Air in the system.	· Fill to proper level. · Reposition hose. · Replace pump. · Perform pump initial operation.
Sucking Air Sound	· Loose return line clamp. · O-ring missing or damaged on hose fitting. · Low fluid level. · Air leak between pump and reservoir.	· Replace clamp. · Replace O-ring. · Fill to proper level. · Repair if necessary.
Scrubbing Or Knocking	· Wrong tire size. · Wrong gear.	· Verify tire size. · Verify gear.

Insufficient Assist / Poor Return To Center Troubleshooting Chart

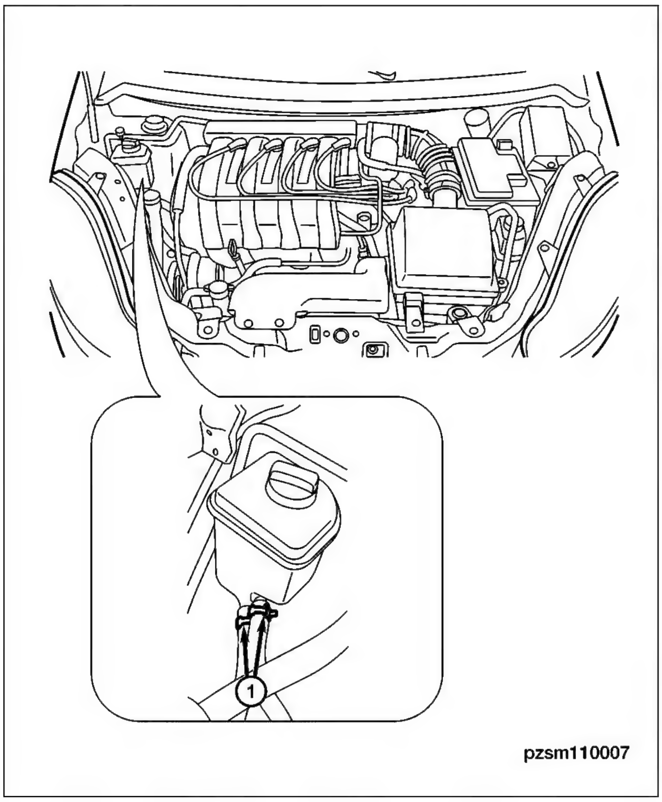
CONDITION	POSSIBLE CAUSES	CORRECTION
Hard Turning Or Momentary Increase In Turning Effort	· Tire pressure. · Low fluid level. · Loose belt. · Lack of lubrication. · Low pump pressure or flow. · Internal gear leak. · Belt routing.	· Adjust tire pressure. · Fill to proper level. · Adjust or replace. · Inspect and lubricate steering and suspension components. · Pressure and flow test and repair if necessary. · Pressure and flow test, and repair if necessary. · Verify belt routing is correct.
Steering Wheel Does Not Want To Return To Center Position	· Tire pressure. · Wheel alignment. · Lack of lubrication. · High friction in steering gear. · Ball joints binding.	· Adjust tire pressure. · Align front end. · Inspect and lubricate steering and suspension components. · Test and adjust if necessary. · Inspect and repair if necessary.

ON-VEHICLE SERVICE

Power Steering Pump

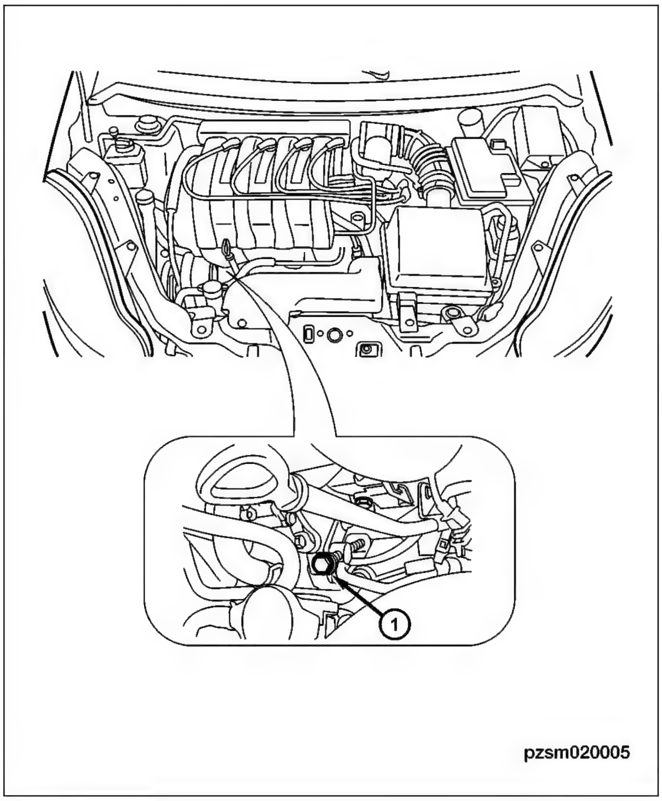
Removal & Installation

1. Siphon out as much power steering fluid as possible from the reservoir.
2. Raise and support the vehicle.
3. Remove the return hose clamps (1) from the power steering fluid reservoir and insert the end of the hose into a container.



4. Start the engine and turn the steering wheel from lock-to-lock until all power steering fluid has been removed from the system.
5. Stop the engine.

6. Loosen the power steering pump drive belt adjustment bolt (1).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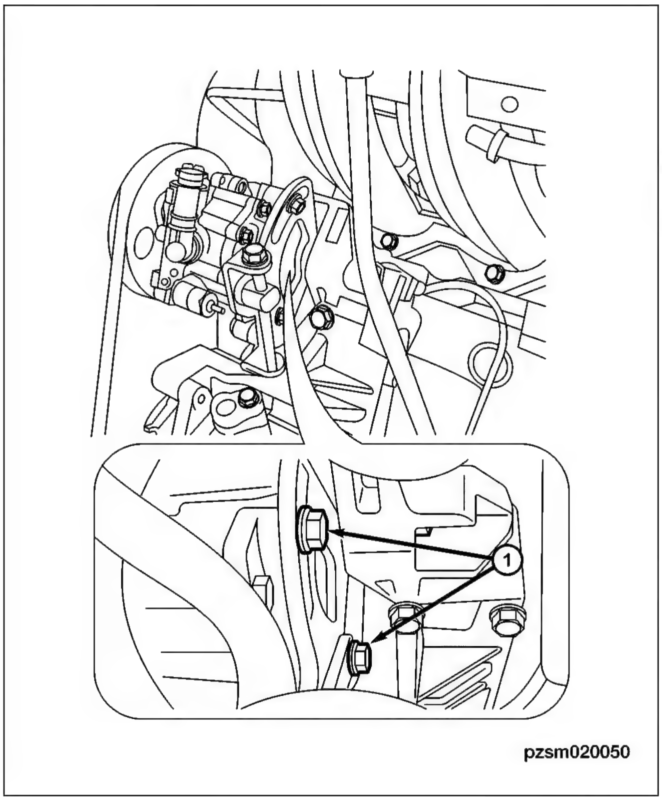
7. Loosen the two bolts (1) on the steering pump bracket.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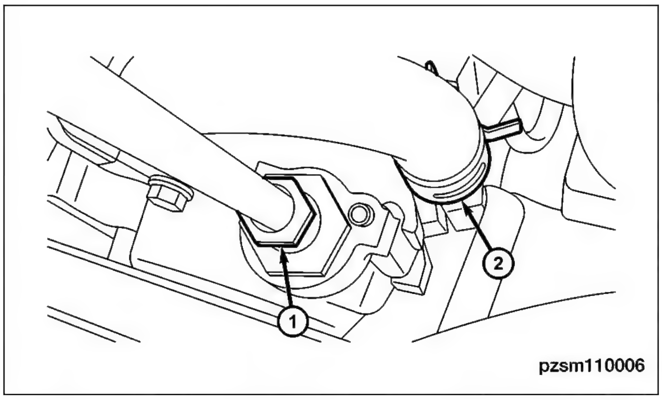
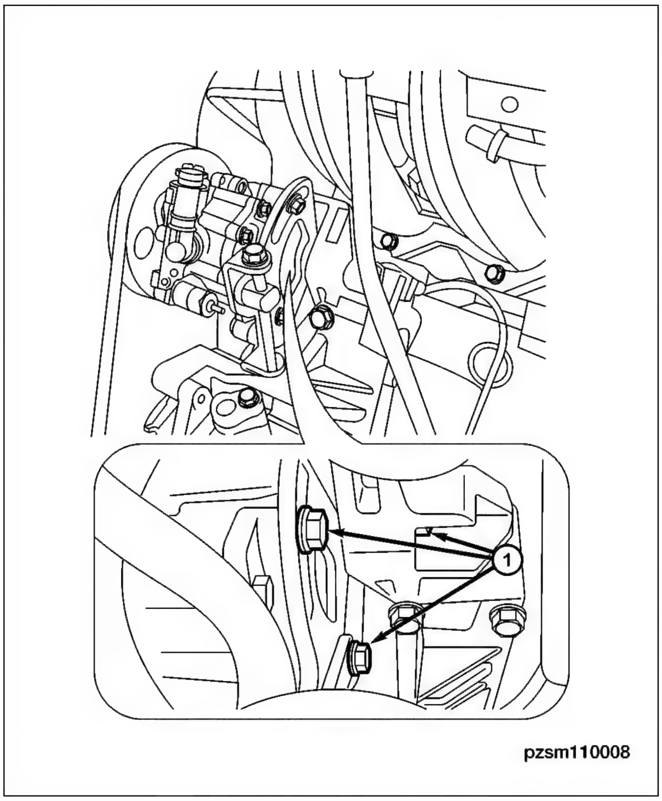
8. Remove the A/C compressor belt.

9. Remove the power steering pump inlet hose clamp (2), and then remove the pump inlet hose.
   Remove the outlet line nut (1) from the pump outlet pipe.
   (Tighten: Steering pump outlet pipe bolt to 45 ± 5 N·m)



10. Remove the three bolts (1) from the power steering pump.
    (Tighten: Power steering pump bolts to 20 ± 5 N·m)



11. Remove the steering pump from the engine bracket.
12. Installation is in the reverse order of removal.

Installation Notes:

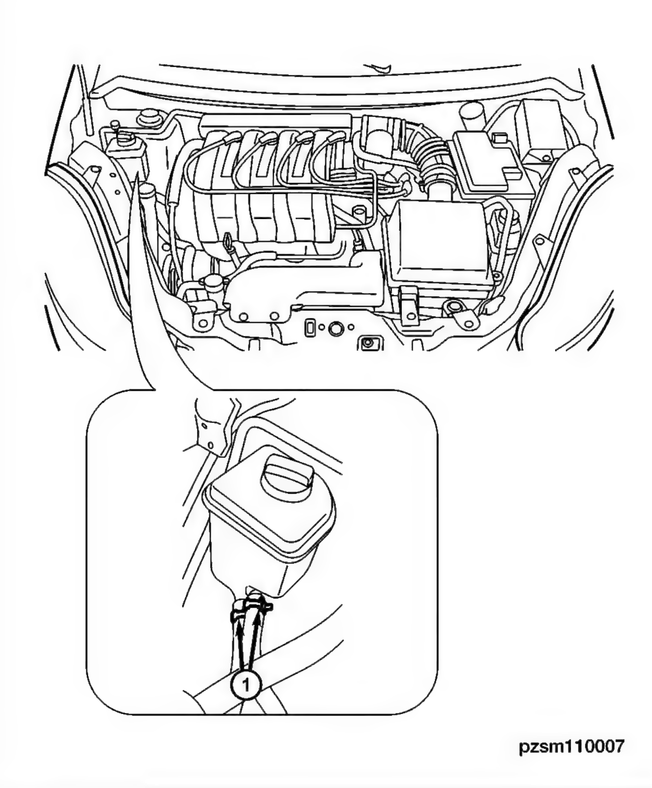
- Fill the power steering fluid reservoir to the proper level.
- Check the system for leaks.

Power Steering Fluid Reservoir

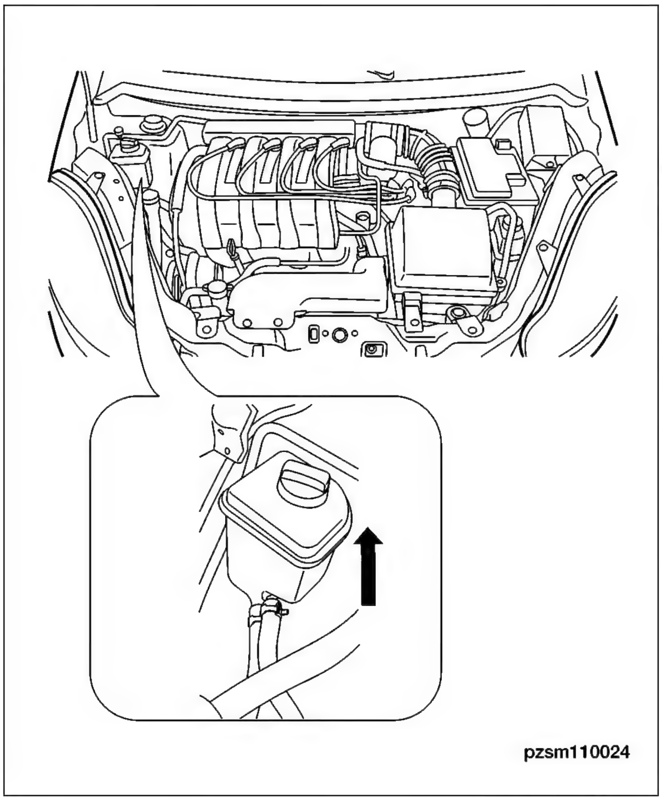
Removal & Installation

1. Siphon as much fluid as possible from the power steering fluid reservoir.

2. Remove the hose clamps (1) securing the return hose and the supply hose to the power steering fluid reservoir fitting.



3. Slide the hose off the end of the reservoir fitting.



4. Installation is in the reverse order of removal.

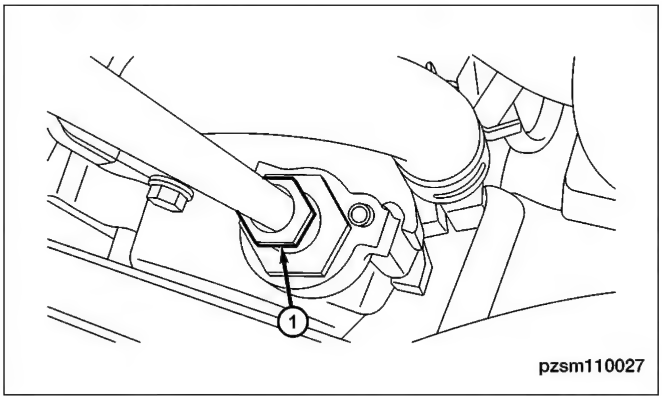
Installation Notes:

- Fill the power steering reservoir to the proper level.
- Check the system for leaks.

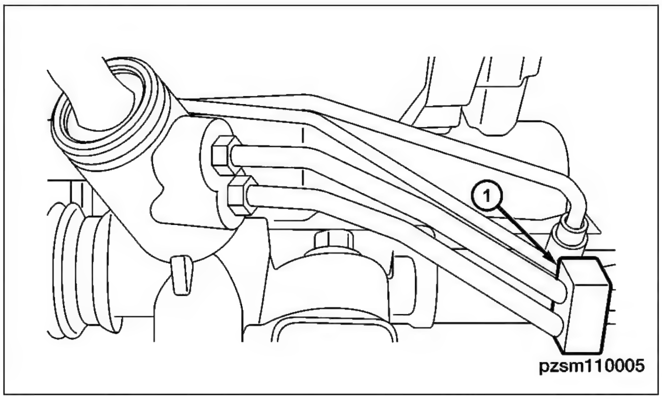
Power Steering Pressure Line

Removal & Installation

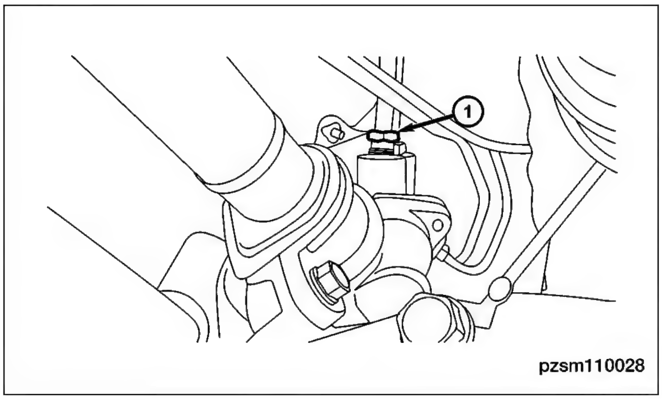
1. Siphon as much fluid as possible from the power steering fluid reservoir.
2. Remove the bolt (1) from the pressure pipe.
   (Tighten: Pressure pipe bolt to 45 ± 5 N·m)



3. Remove the power steering pressure line bracket retaining bolts.
4. Remove the power steering pressure hose clamp (1).



5. Loosen the lower bolt and remove the retaining bolt (1) on the pressure pipe bracket.
   (Tighten: Pressure pipe bolt to 20 ± 5 N·m)



6. Remove the pressure line.
7. Installation is in the reverse order of removal.

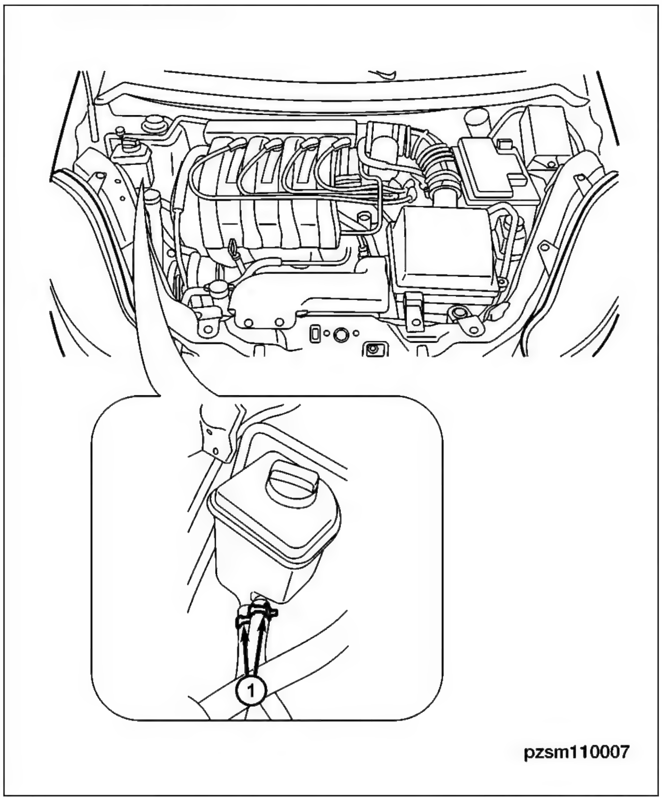
Installation Notes:

- Fill the power steering fluid reservoir to the proper level.
- Check the power steering system for leaks.

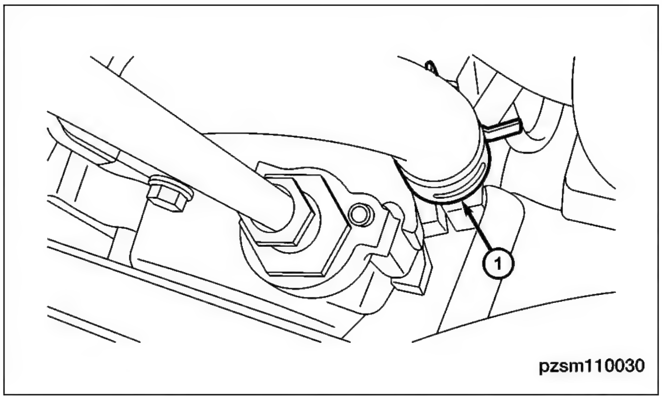
Power Steering Return Line

Removal & Installation

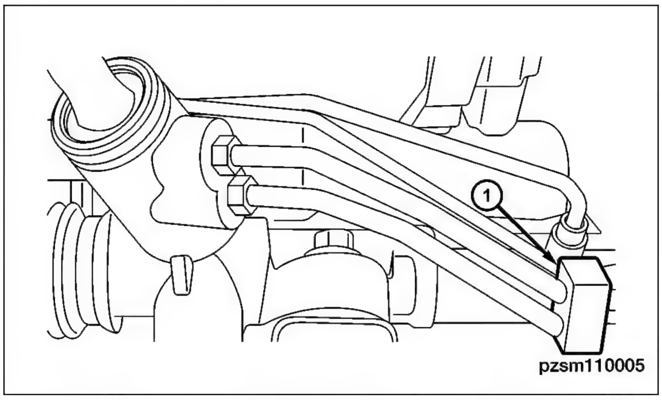
1. Siphon as much fluid as possible from the power steering fluid reservoir.
2. Loosen the clamps (1), and remove the return hose from the power steering fluid reservoir.



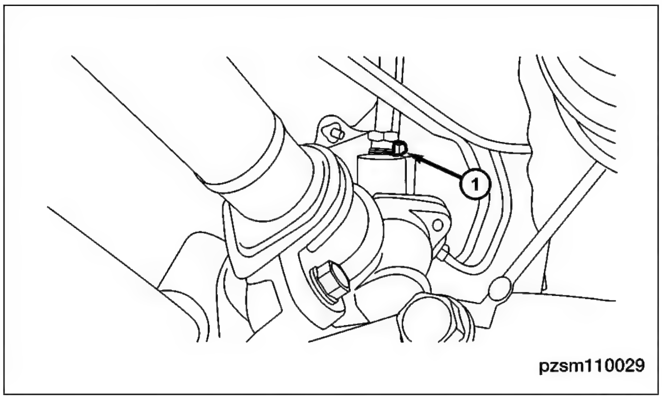
3. Remove the clamp (1) from the power steering return hose.



4. Remove the power steering return line bracket retaining bolts.
5. Remove the power steering return line clamp (1).



6. Loosen the upper nut and remove the retaining bolt (1) on the return line bracket.
   (Tighten: Return line bolt to 20 ± 5 N·m)



7. Remove the return line.
8. Installation is in the reverse order of removal.

Installation Notes:

- Fill the power steering reservoir to the proper level.
- Check the system for leaks.

BRAKES
12

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Parking Brake **12-80**

BASE BRAKES

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GENERAL INFORMATION

Description

The base brake system consists of the following components:

- Power brake booster
- Master cylinder
- Brake pedal
- Front disc brakes
- Parking brake
- Brake tubes and hoses
- Rear drum brakes

The disc brake assembly consists of the following major components:

- Caliper
- Caliper adapter bracket
- Brake pads
- Rotor

CAUTION:

- **Use DOT 4 brake fluid or equivalent from a tightly sealed container. Do not use petroleum-based fluids, which would cause seal damage in the brake system.**
- **Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surfaces, wash it off immediately with water.**
- **Never use gasoline, kerosene, alcohol, motor oil, transmission fluid or any fluid containing mineral oil to clean system components. These fluids damage rubber cups and seals.**
- **During service procedures, grease or any other foreign material must be kept off the caliper assembly, brake pads, brake rotor and external surfaces of the hub.**
- **When handling the brake rotor and caliper, be careful to avoid damaging the brake rotor and caliper, and scratching or nicking the brake shoe lining.**

Operation

Applying the brake pedal uses lever action to push a rod into the brake booster, which through the use of vacuum, boosts the force of the rod and then transmits this force into the master cylinder. This produces hydraulic pressure in the master cylinder. On vehicles not equipped with an Antilock Brake System (ABS), the hydraulic pressure is transmitted by brake fluid through the brake tubes to the individual brake calipers or wheel cylinders. On vehicles equipped with ABS, the hydraulic pressure is transmitted by brake fluid through the brake tubes to the ABS Hydraulic Control Unit (HCU), which then distributes that pressure to the individual brake calipers and wheel cylinders. The brake calipers use hydraulic pressure to apply the brake pads. The application of the brake pads or shoes will cause the rotation of the wheels to slow or stop depending on how much brake pressure is applied. The parking brakes carry out the same function except that they are mechanically actuated by a cable that connects only to the rear brakes.

Specifications

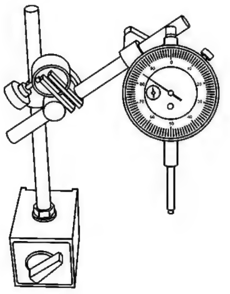
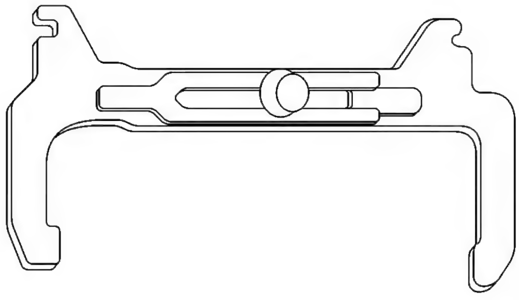
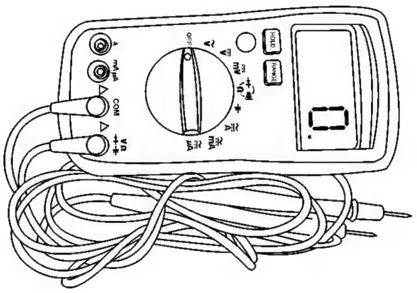
Torque Specifications

DESCRIPTION	TORQUE (N·m)
Front Axle Shaft Hub Nut	250 ± 10
Brake Rotor to Hub Mounting Screw	8
Brake Flex Hose Fitting – Front Caliper	17
Brake Pedal/Booster Mounting Nuts	25
Brake Tube Nuts	16 ± 3
Disc Brake Caliper Adapter Bracket (To Knuckle) - Front	85
Disc Brake Caliper Guide Pin Bolts - Front	23
Disc Brake Caliper Bleeder Screw	10
Fluid Reservoir Mounting Screw	11
Master Cylinder Mounting Nuts	23
Parking Brake Lever Mounting Nuts	9 - 12
Rear Hub and Bearing Nut	250 ± 10
Rear Brake Drum to Hub Mounting Screw	8
Wheel Mounting Nuts	110

Rotor Specifications

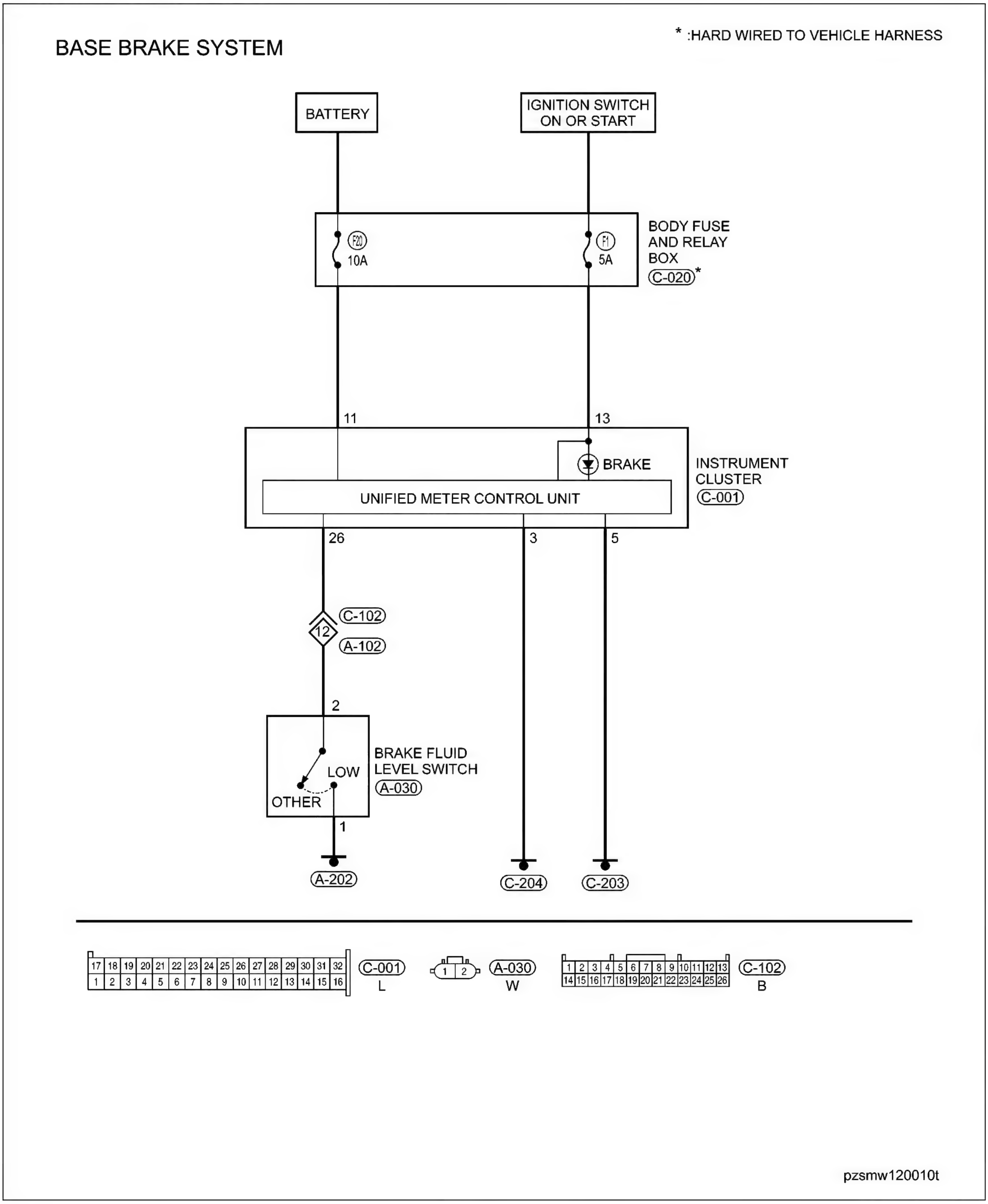
BRAKE ROTOR	ROTOR THICKNESS	MINIMUM ROTOR THICKNESS	ROTOR THICKNESS VARIATION	ROTOR RUNOUT
Front Rotor	17 mm	15 mm	0.03 mm	0.03 mm

Special Tools

Dial Indicator	 besm120026
Brake Measuring Gauge	 besm120025
Digital Multimeter Fluke 15B & 17B	 besm030002

Electrical Schematics

Brake System (Page 1 of 1)


BASE BRAKE SYSTEM
* :HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
F20
10A
F1
5A
BODY FUSE AND RELAY BOX
C-020*
11
13
BRAKE
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
26
3
5
C-102
12
A-102
2
LOW
OTHER
BRAKE FLUID LEVEL SWITCH
A-030
1
A-202
C-204
C-203
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-001
L
1 2
A-030
W
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
C-102
B
pzsmw120010t

DIAGNOSIS & TESTING

Diagnostic Help

Brake diagnosis involves determining if the concern is related to a mechanical, hydraulic, electrical or vacuum operated component.

NOTE :
The brake reservoir fluid level will decrease in proportion to normal lining wear.

NOTE :
Brake fluid tends to darken over time. This is normal and should not be mistaken for contamination.

NOTE :
Before starting repairs which do not require battery power:

- Turn off ignition switch.
- Disconnect the negative battery terminal.

Preliminary Brake Check:

- Check the condition of the tires and wheels. Damaged wheels and worn, damaged or under inflated tires can cause a pull, shudder, vibration and a condition similar to brake grab.
- If a complaint was based on noise while braking, check the suspension components. Jounce the front and the rear of vehicle and listen for anything that might be caused by a loose, worn or damaged suspension or steering component.
- Inspect the brake fluid level and condition.
    1. If the fluid level is abnormally low, look for any evidence of leaks at the calipers, brake lines, master cylinder and at the Antilock Brake System (ABS) Hydraulic Control Unit (HCU).
    2. If the fluid appears to be contaminated, drain a sample to examine.
- The system will have to be flushed if the fluid is separated into layers, or contains a substance other than brake fluid. The system seals, cups, hoses, master cylinder and HCU will also have to be replaced after flushing. Use clean brake fluid to flush the system.
- Check the parking brake operation. Verify free movement and full release of the cables and the lever. Also note if the vehicle was being operated with the parking brake partially applied.
- Check the brake pedal operation. Verify that the pedal does not bind and has adequate free play. If the pedal lacks free play, check the pedal and the power booster for looseness or for a binding condition. DO NOT road test the vehicle until the condition is located and corrected.
- Check the vacuum booster check valve and vacuum supply hose.
- If the preliminary checks appear to be OK, road test the vehicle.

Brake Noise

CONDITION	POSSIBLE CAUSES	CORRECTION
Disc Brake Chirp	· Excessive brake rotor runout. · Small metal particles	· Diagnose and correct as necessary.
Disc Brake Rattle Or Clunk	· Broken or missing spring clips. · Caliper guide pin bolts loose. · Missing abutment shims. · Small metal particles	· Replace brake pads · Tighten guide pin bolts. · Replace missing abutment shims.
Disc Brake Squeak At Low Speed (While Applying Light Brake Pedal Effort)	· Brake shoe linings.	· Replace brake pads.
Scraping Or Whirring	· ABS wheel speed sensor hitting tone wheel.	· Inspect, correct or replace faulty component(s).

Braking Concerns

CONDITION	POSSIBLE CAUSES	CORRECTION
Excessive Pedal Effort	· Obstruction of brake pedal. · Low power brake booster assist. · Glazed brake pads. · Brake pad lining transfer to brake rotor.	· Inspect, remove or move obstruction. · Refer to Power Brake Booster in this section. · Resurface or replace brake rotors as necessary. Replace brake pads. · Resurface or replace brake rotors as necessary. Replace brake pads.
Excessive Pedal Effort (Hard Pedal — Cannot Skid Wheels)	· Power brake booster runout (vacuum assist).	· Check booster vacuum hose and engine tune for adequate vacuum supply.
Excessive Pedal Travel (Vehicle Stops OK)	· Air in brake lines.	· Bleed brakes.
Pedal Pulsates/Surges During Braking	· Disc brake rotor has excessive thickness variation.	· Isolate condition as rear or front. Resurface or replace brake rotors as necessary.
Pedal Is Spongy	· Air in brake lines.	· Bleed brakes.
Vehicle Pulls To Right Or Left On Braking	· Frozen brake caliper piston. · Contaminated brake pad/shoe lining (most likely front lining). · Pinched brake lines. · Leaking piston seal. · Suspension problem.	· Replace frozen piston or caliper. Bleed brakes. · Inspect and clean, or replace pads/shoes. Repair source of contamination. · Replace pinched line. · Replace piston seal or brake caliper. · See the Suspension section.
Parking Brake—Excessive Handle Travel	· Rear brakes out of adjustment.	· Adjust rear parking brake shoes on vehicles with rear disc brakes.

ON-VEHICLE SERVICE

Brake Bleeding

Brake Bleeding Information

WARNING!

When bleeding the brake system, wear safety glasses. A clear bleed tube must be attached to the bleeder screws and submerged in a clear container filled partially with clean brake fluid. Direct the flow of brake fluid away from yourself and the painted surfaces of the vehicle. Brake fluid at high pressure may come out of the bleeder screws when opened.

CAUTION:

Before removing the master cylinder cap, wipe it clean to prevent dirt and other foreign matter from dropping into the master cylinder reservoir. Use brake fluid or an equivalent from a fresh, tightly sealed container. Brake fluid must conform to DOT 4 specifications.

NOTE :

During the brake bleeding procedure, be sure the brake fluid level remains close to the ″MAX″ level in the master cylinder fluid reservoir. Check the fluid level periodically during the bleeding procedure and add brake fluid as required.

NOTE :

Do not pump the brake pedal at any time while having a bleeder screw open during the bleeding process. This will only increase the amount of air in the system and make additional bleeding necessary. Do not allow the master cylinder reservoir to run out of brake fluid while bleeding the system. An empty reservoir will allow additional air into the brake system. Check the fluid level frequently and add fluid as needed. The following wheel circuit sequence for bleeding the brake hydraulic system should be used to ensure adequate removal of all trapped air from the hydraulic system.

Brake Bleeding Procedure

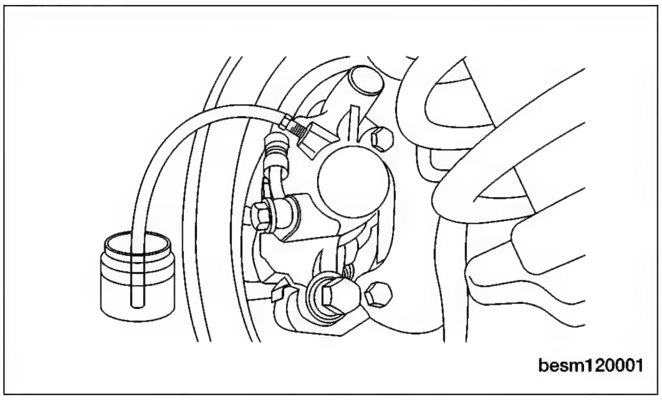
The following wheel circuit sequence for bleeding the brake hydraulic system should be used to ensure adequate removal of all trapped air from the hydraulic system:

- Left rear wheel
- Right front wheel
- Right rear wheel
- Left front wheel

Manual Bleeding

NOTE :

To bleed the brakes manually, the aid of a helper will be required.



Attach a clear plastic hose to the bleeder screw and feed the hose into a clear jar containing enough fresh brake fluid to submerge the end of the hose.

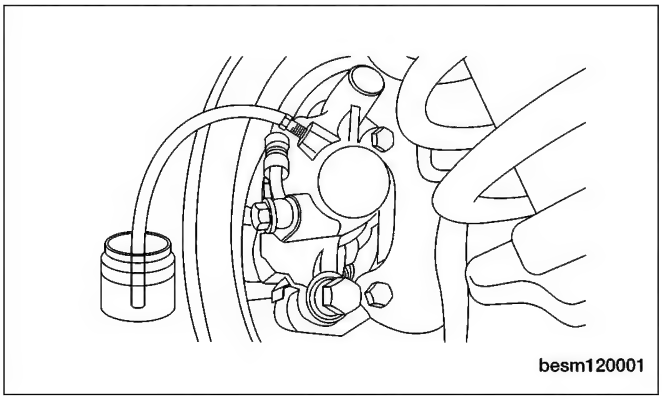
1. Turn the ignition switch off.
2. Have a helper pump the brake pedal three or four times and hold it in the down position.
3. With the pedal in the down position, open the bleeder screw at least one full turn.
4. Once the brake pedal has dropped, close the bleeder screw. After the bleeder screw is closed, release the brake pedal.
5. Repeat the above steps until all trapped air is removed from that wheel circuit (usually four or five times).
6. Bleed the remaining wheel circuits in the same manner until all air is removed from the brake system. Monitor the fluid level in the master cylinder reservoir to make sure it does not go dry.
7. Check and adjust brake fluid level to the ″MAX″ mark.
8. Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Re-bleed the brakes as necessary.
9. Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.

Pressure Bleeding

NOTE :
Follow pressure bleeder manufacturer's instructions for use of pressure bleeding equipment.

Attach the pressure bleeding equipment to the master cylinder.

Attach a clear plastic hose to the bleeder screw and feed the hose into a clear jar containing enough fresh brake fluid to submerge the end of the hose.



1. Turn the ignition switch off.
2. Open the bleeder screw at least one full turn or more to obtain a steady stream of brake fluid.
3. After approximately 120-240 ml of fluid have been bled through the brake circuit and an air-free flow is maintained in the clear plastic hose and jar, close the bleeder screw.
4. Repeat this procedure at all the remaining bleeder screws.
5. Check and adjust brake fluid level to the ″MAX″ mark on the reservoir.
6. Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Re-bleed the brakes as necessary.
7. Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.

Master Cylinder

Description

The master cylinder body is an anodized aluminum casting. It has a machined bore to accept the master cylinder pistons and also has threaded ports with seats for hydraulic brake tube connections. The master cylinder has the brake fluid reservoir mounted on top of it and supplies brake fluid to the master cylinder as required. The brake fluid reservoir also feeds the clutch hydraulic circuit. The reservoir is made of clear plastic and it houses the brake fluid level switch.

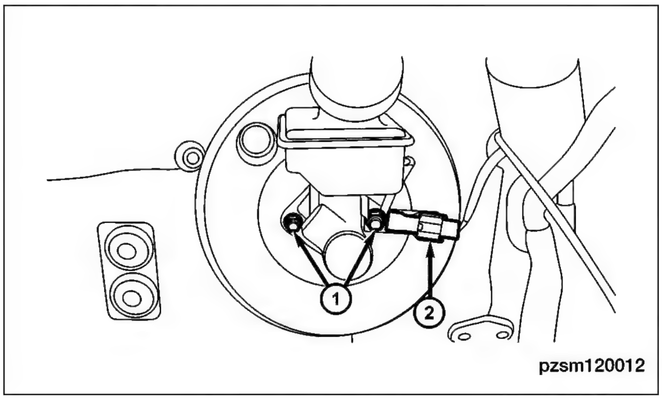
Operation

When the brake pedal is pressed, the master cylinder pistons apply brake pressure through the chassis brake tubes to each brake assembly. The brake fluid reservoir supplies the brake hydraulic system with the necessary fluid to operate properly.

Removal & Installation

CAUTION:
The vacuum in the power brake booster must be pumped down before removing the master cylinder to avoid damaging the master cylinder and to prevent the booster from sucking in any contamination. This can be done by pumping the brake pedal while the engine is not running until a firm brake pedal is achieved.

1. Turn the ignition switch off.
2. Siphon out as much brake fluid as possible from the master cylinder.
3. With the engine off, pump the brake pedal 4 - 5 strokes until the pedal feel is firm.
4. Disconnect the negative battery cable.
5. Disconnect the brake tubes at the master cylinder outlet ports. Install plugs at all of the open brake tube outlets on the master cylinder.
   (Tighten: Brake tube nuts to 10 N·m)
6. Clean the area around where the master cylinder attaches to the power brake booster using a suitable brake cleaner such as Brake Parts Cleaner or an equivalent.
7. Remove the two nuts (1) attaching the master cylinder to the power brake booster.
   (Tighten: Master cylinder mounting nuts to 23 N·m)
8. Disconnect the brake fluid level switch electrical connector (2) from the master cylinder brake fluid reservoir.



9. Slide the master cylinder straight out of the power brake booster.
10. Installation is in the reverse order of removal.

    NOTE: After installation, bleed the master cylinder or bleed the entire brake system as necessary.

Power Brake Booster

Description

The power brake booster is mounted to the engine compartment side of the dash panel. The master cylinder is bolted to the front of the booster.

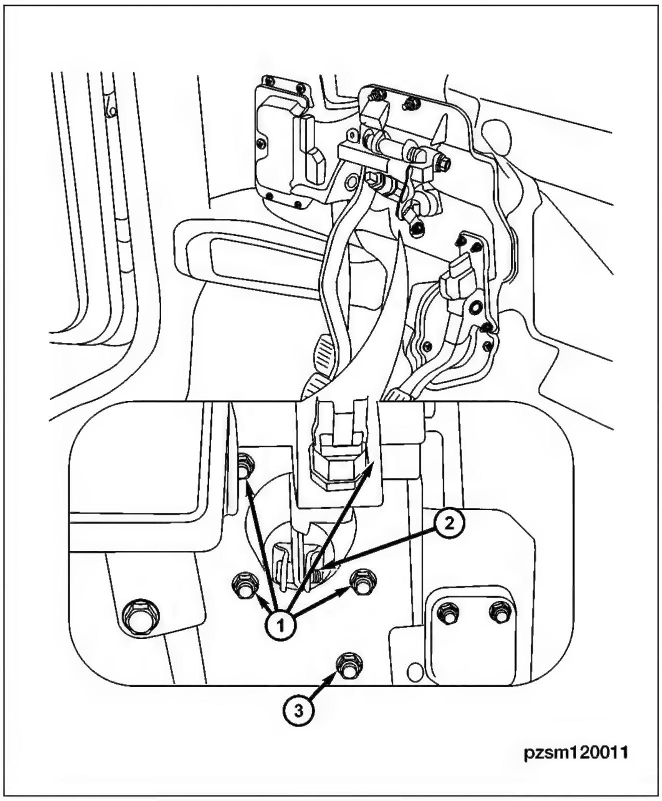
Operation

A vacuum line connects the check valve to engine source vacuum. The booster input rod extends through the dash panel and connects to the brake pedal.

Removal & Installation

CAUTION:
The vacuum in the power brake booster must be pumped down before removing the master cylinder to avoid damaging the master cylinder and to prevent the booster from sucking in any contamination. This can be done by pumping the brake pedal while the engine is not running until a firm brake pedal is achieved.

1. Remove the master cylinder (See Master Cylinder Removal & Installation in Section 12 Brakes).
2. Disconnect the vacuum hose from the check valve on the power brake booster.



3. Remove the pin (2) from the brake booster rod.
4. Remove the nuts (1) & (3) attaching the power brake booster to the dash panel.
   (Tighten: Brake pedal/Power brake booster mounting nuts to 25 N·m)
5. Slide the power brake booster forward until its mounting studs clear the dash panel, then remove it through the engine compartment.
6. Installation is in the reverse order of removal.

Front Brake Caliper

Description

The calipers are a single piston type. The calipers are free to slide laterally on the anchor, this allows continuous compensation for lining wear. The calipers are directly bolted to the wheel hub with mounting bolts. The brake rotor dust shield is mounted to the hub.

Operation

When the brakes are applied, fluid pressure is exerted against the caliper piston. The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper piston and within the caliper bore will be equal. Fluid pressure applied to the pistons is transmitted directly to the inboard brake pad. This forces the pad lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bore forces the caliper to slide inward on the slide pins. This action brings the outboard brake pad lining into contact with the outer surface of the disc brake rotor.

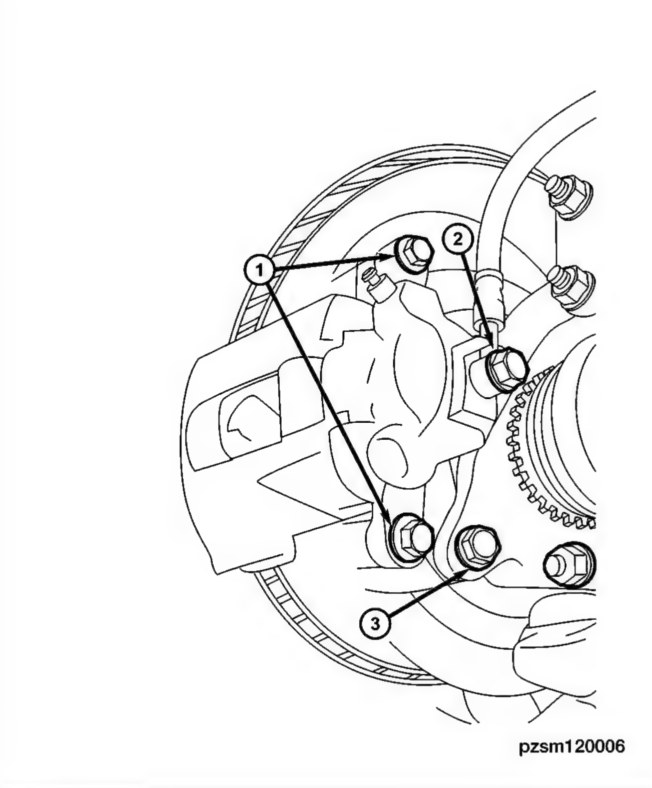
Removal & Installation

1. Using a brake pedal holding tool, depress the brake pedal past its first 25 mm of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir when the lines are opened.
2. Raise and support the vehicle.
3. Remove the wheel mounting nuts and the tire and wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)

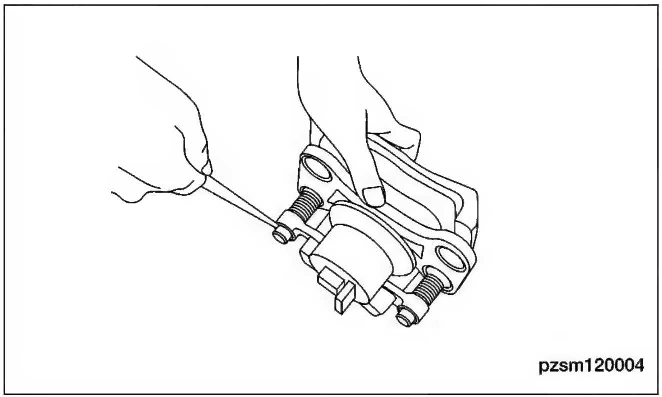
NOTE :
In some cases, it may be necessary to retract the caliper piston in its bore a small amount in order to provide sufficient clearance between the pads and the rotor.

4. Remove the front brake hose (2) from the front brake caliper.
   (Tighten: Front caliper brake hose nut to 16 ± 3 N·m)

   NOTE: The brake liquid is one toxic liquid. Do not splash the brake liquid to the clothes or skin during the removal of the brake hose.
5. Remove the front caliper guide bolts (1).
   (Tighten: Front caliper guide bolts to 23 N·m)
6. If necessary, remove the brake caliper bracket mounting bolts (3).
7. Remove the brake pads.



8. Slide the front brake caliper from the disc brake adapter bracket and remove.



9. Installation is in the reverse order of removal.

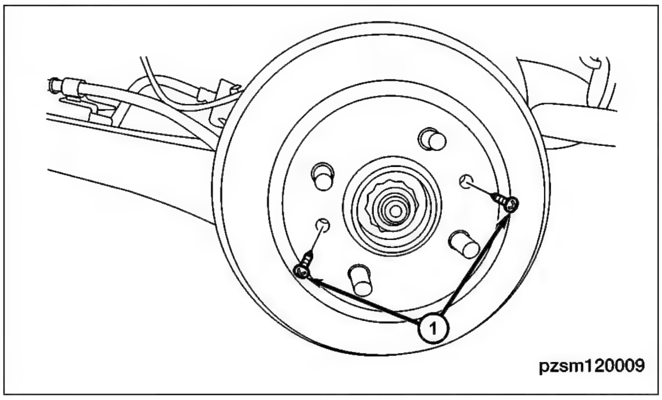
Installation Notes:

- Completely retract the caliper piston back into the bore of the caliper.
- After installation bleed the caliper as necessary.

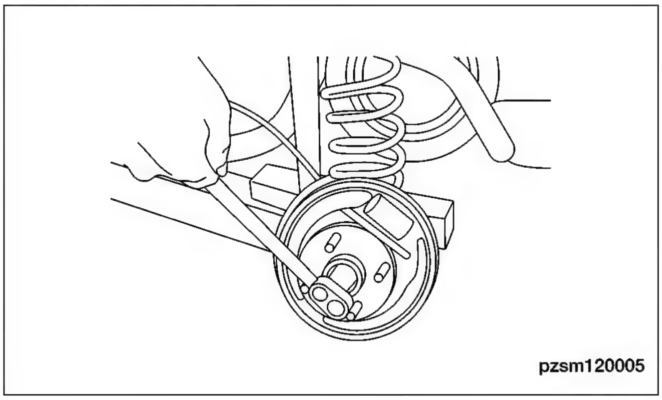
Rear Wheel Cylinder

Removal & Installation

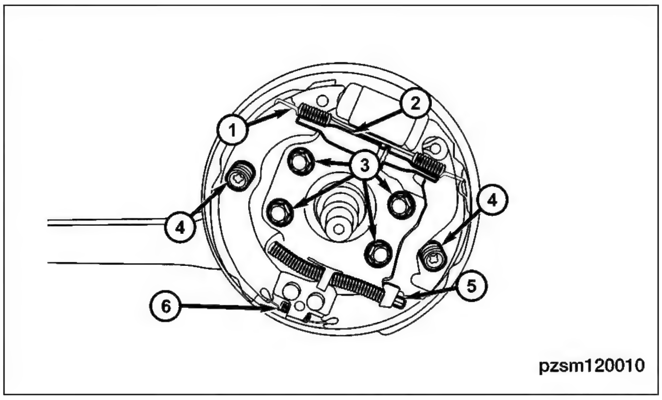
1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly. (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the two brake drum mounting screws (1) from the brake drum.



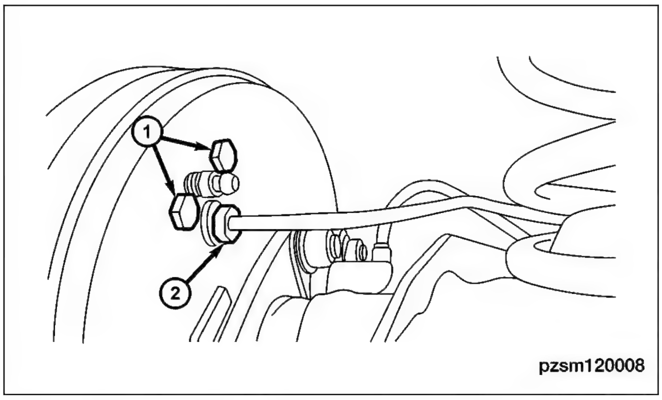
4. Remove the brake drum bearing dust cap.
5. Rotate the brake drum and remove the brake drum from the axle hub.
6. Remove the rear hub and bearing nut. (Tighten: Rear hub and bearing nut to 250 ± 10 N·m)



7. Remove the parking brake cable (5).
8. Remove the upper return spring (1).
9. Remove the lower return spring (6).
10. Remove the brake shoe hold-down springs (4) and pins. Rotate the pins 90° to disengage.
11. Remove the two brake shoes.
12. Remove the spring (2) and separate the brake shoes.



13. Remove the rear wheel cylinder retaining bolts (1) and the brake tube nut (2).
14. Remove the rear wheel cylinder.



15. Installation is in the reverse order of removal.

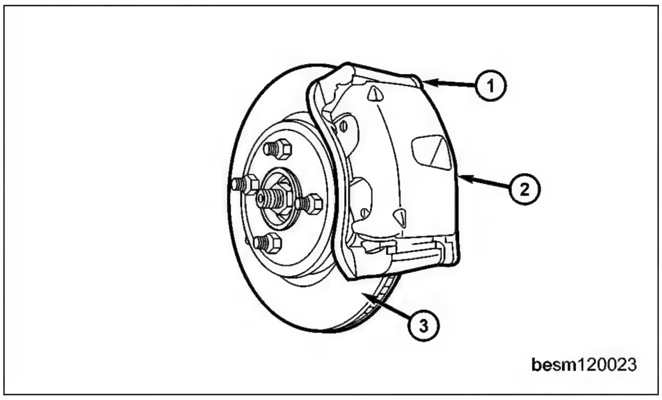
Installation Notes:

- After installation bleed the wheel cylinder as necessary.

Front Brake Rotor

Removal & Installation

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly. (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove front caliper (2) and bracket (1) together (See Front Caliper Removal & Installation in Section 12 Brakes).
4. Slide the front brake rotor (3) off the hub and bearing.
5. Installation is in the reverse order of removal.



Inspection

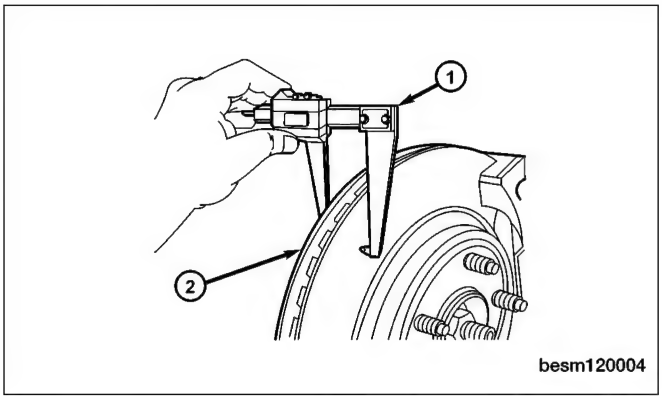
Excessive runout or wobble in a rotor can increase pedal travel due to piston knock-back. This increases guide pin sleeve wear due to the tendency of the caliper to follow the rotor wobble.

Braking Surface Inspection

Light braking surface scoring and wear is acceptable. If heavy scoring or warping is evident, the rotor must be resurfaced or replaced. Excessive wear and scoring of the rotor can cause improper lining contact on the rotor's braking surface. If the ridges on the rotor are not removed before new brake pads are installed, improper wear of the shoes will result. Some discoloration or wear of the rotor surface is normal and does not require resurfacing when linings are replaced. If cracks or burned spots are evident, the rotor must be replaced.

Rotor Minimum Thickness

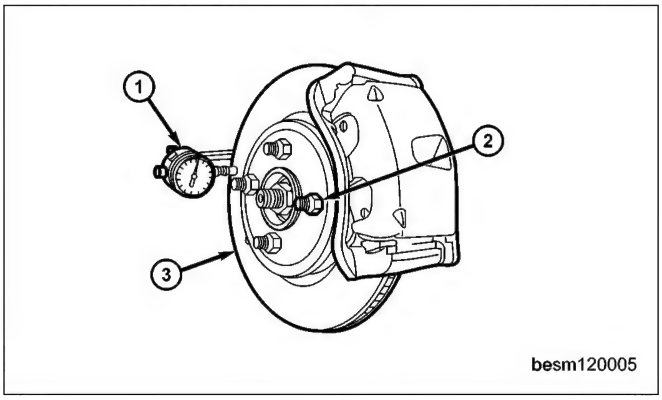
Measure the rotor thickness (1) at the center of the brake pad contact surface. Replace the rotor (2) if it is worn below minimum thickness or if machining the rotor will cause its thickness to fall below specifications.



CAUTION:
Do not machine the rotor if it will cause the rotor to fall below minimum thickness.

Rotor Runout

1. Install standard wheel mounting nuts, flat side to rotor, on all the wheel studs (2). Progressively tighten the nuts in a crisscross pattern to 110 N·m.
2. Mount a dial indicator (1), with wheel, or equivalent, to the knuckle. Position the dial indicator wheel to contact the rotor braking surface approximately 10 mm from the outer edge of the rotor.
3. Slowly rotate the brake rotor (3) checking lateral runout, marking the low and high spots. Record these measurements.
4. Check and record the runout on the opposite side of the rotor in the same fashion, marking the low and high spots.
5. Compare runout measurement to specification.
6. If runout is in excess of specifications, check the lateral runout of the hub face.



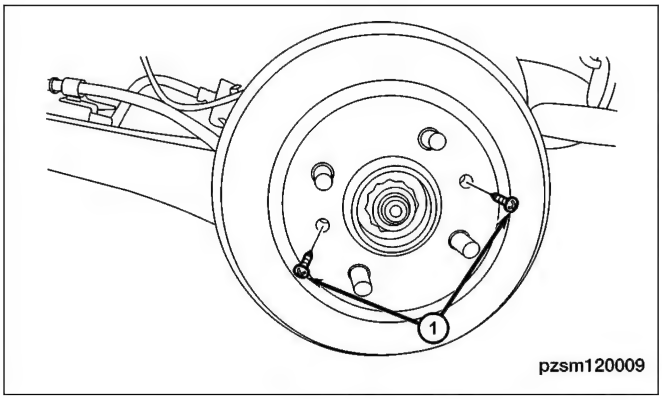
BRAKE ROTOR	ROTOR THICKNESS	MINIMUM ROTOR THICKNESS	ROTOR RUNOUT
Front Rotor	17 mm	15 mm	0.03 mm

Rear Brake Drum

Removal & Installation

1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly.
(Tighten: Wheel mounting nuts to 110 N·m)

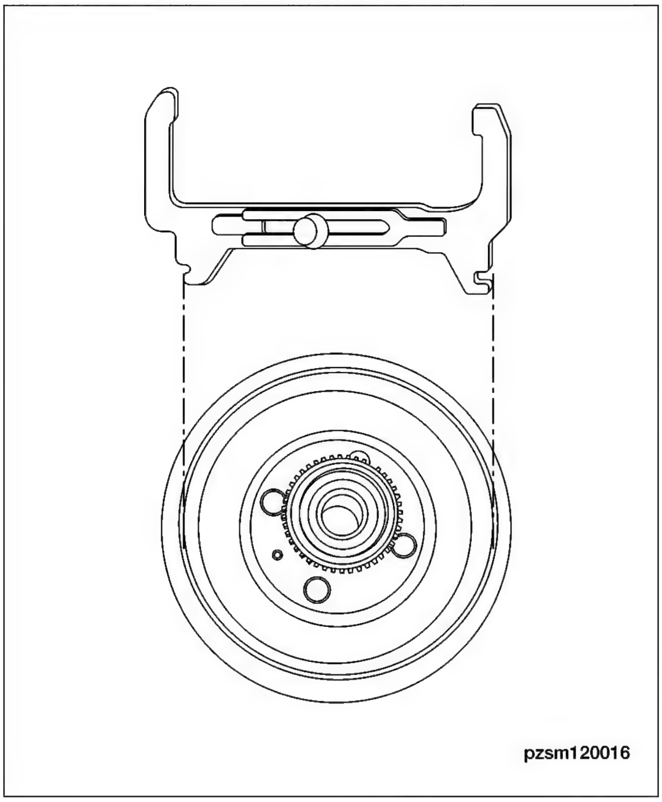
3. Remove the two brake drum mounting screws (1) from the brake drum.



4. Remove the brake drum bearing dust cap.
5. Rotate the brake drum and remove the brake drum from the axle hub.
6. Installation is in the reverse order of removal.

Installation Notes:

- Using a brake measuring gauge or equivalent, measure the inside diameter of the brake drum.
- Place the brake measuring gauge over the brake shoes at their widest point.
- Using the adjuster wheel, adjust the brake shoes until the linings on both brake shoes just touch the jaws on the brake measuring gauge.



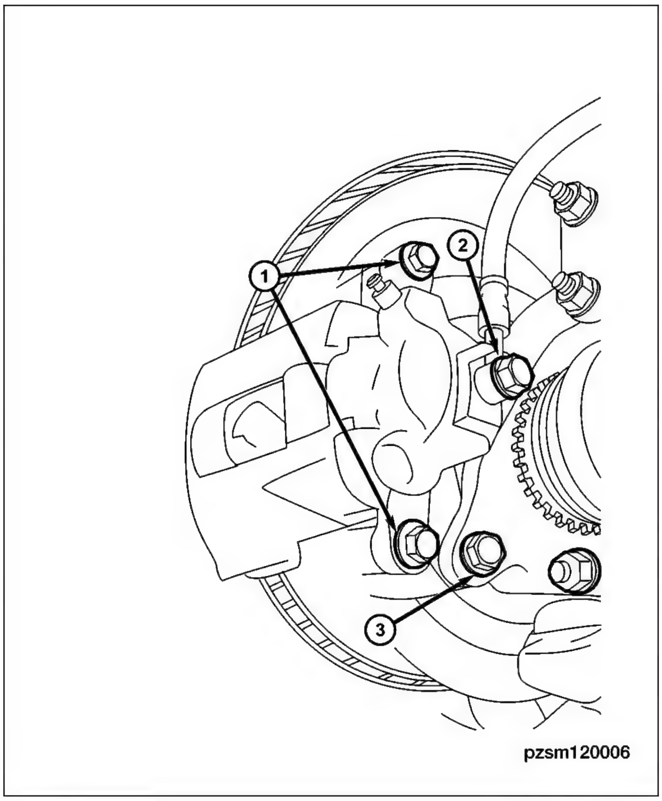
Front Brake Pads

Removal & Installation

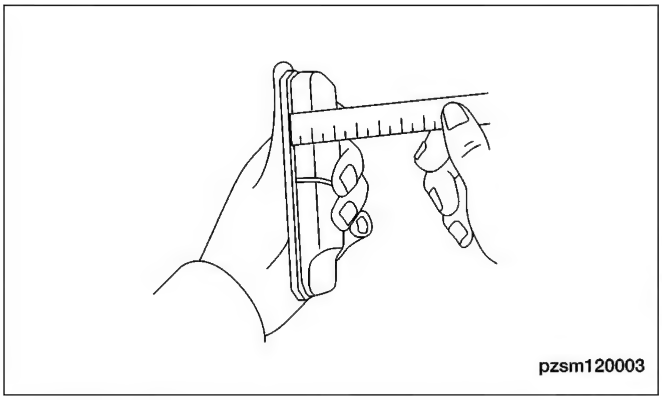
1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly. (Tighten: Wheel mounting nuts to 110 N·m)

NOTE :
In some cases, it may be necessary to retract the caliper piston in its bore a small amount in order to provide sufficient clearance between the pads and the rotor.

3. Remove the front caliper guide bolts (1).
   (Tighten: Front caliper guide bolts to 23 N·m)
4. Remove the brake caliper.
5. Remove the brake pads from the caliper mounting bracket.



6. Measure the thickness of the brake pad. If the brake pads measure less than 1 mm, replace the brake pads.
7. Installation is in the reverse order of removal.



Installation Notes:

- Before installing brake pads, completely retract the caliper piston back into the bore of the caliper.
- After installation and before moving the vehicle, pump the brake pedal several times to set the pads to the brake rotor.
- Check and adjust the brake fluid level in the reservoir after replacing brake pads, check brake fluid level to ensure it is between ″MIN″ and ″MAX″.
- Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake pads.
- After installation and before moving the vehicle, pump the brake pedal several times to set the pads to the brake rotor.

Inspection

- **Brake Pads**
  - Visually inspect brake pads for uneven lining wear.
  - Inspect for excessive lining deterioration.
  - Check the clearance between the tips of the wear indicators (if equipped) on the pads and the brake rotors.
  - If a visual inspection does not adequately determine the condition of the lining, a physical check will be necessary.
  - To check the amount of lining wear, remove the disc brake pads from the vehicle.
  - Measure the brake pad minimum thickness.
  - Brake pads must be replaced when usable material on a brake pad lining measured at its thinnest point measures one millimeter or less.
  - Replace both disc brake pads (inboard and outboard) on each caliper.
  - It is necessary to replace the pads on the opposite side of the vehicle as well as the pads failing inspection to maintain proper braking characteristics.

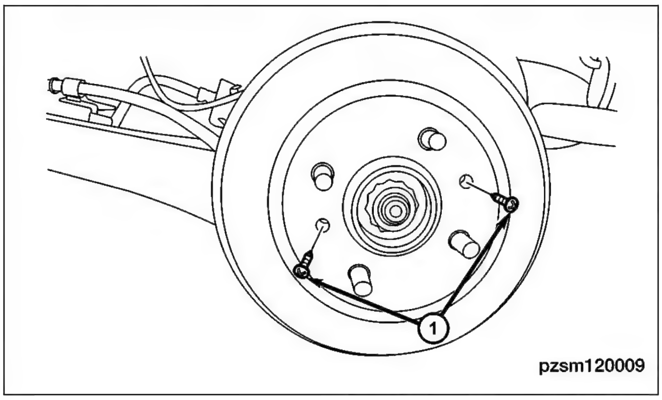
- If the brake pad assemblies do not require replacement, be sure to reinstall the brake pads in the original position from which they were removed.

FRONT BRAKE PAD SPECIFICATIONS	
Standard Pad Thickness	10 mm
Minimum Pad Thickness	1 mm

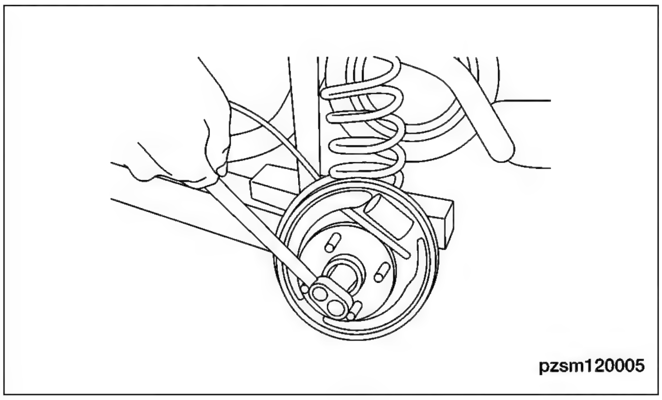
Rear Brake Shoes

Removal & Installation

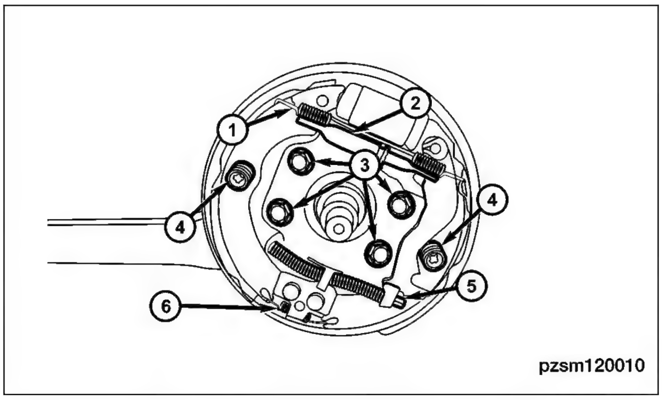
1. Raise and support the vehicle.
2. Remove the wheel mounting nuts and the tire and wheel assembly. (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the two brake drum mounting screws (1) from the brake drum.



4. Remove the brake drum bearing dust cap.
5. Rotate the brake drum and remove the brake drum from the axle hub.
6. Remove the rear hub and bearing nut. (Tighten: Rear hub and bearing nut to 250 ± 10 N·m)

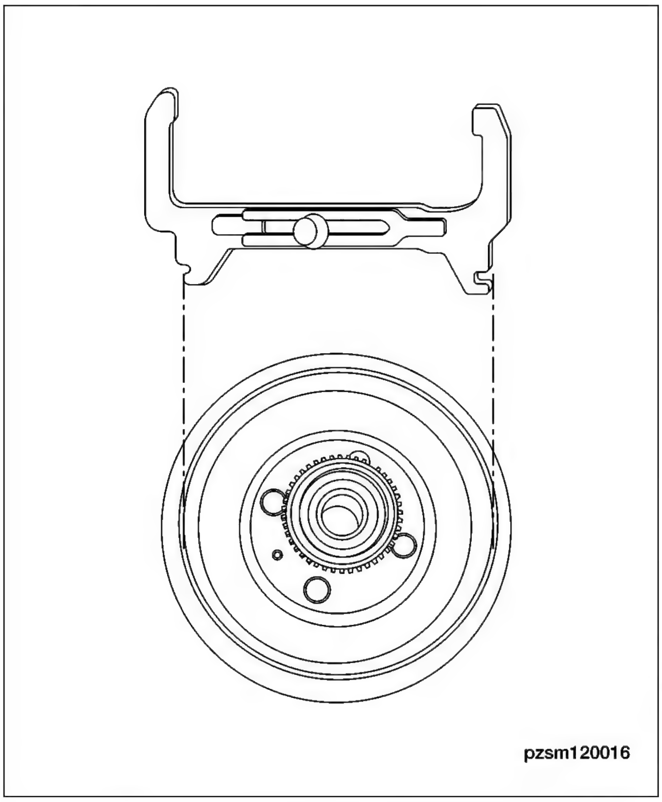


7. Remove the parking brake cable (5).
8. Remove the upper return spring (1).
9. Remove the lower return spring (6).
10. Remove the brake shoe hold-down springs (4) and pins. Rotate the pins 90° to disengage.
11. Remove the two brake shoes.
12. Remove the spring (2) and separate the brake shoes.
13. Installation is in the reverse order of removal.



Installation Notes:

- Using a brake measuring gauge or equivalent, measure the inside diameter of the brake drum.



- Place the brake measuring gauge over the brake shoes at their widest point.
- Using the adjuster wheel, adjust the brake shoes until the linings on both brake shoes just touch the jaws on the brake measuring gauge.

Inspection

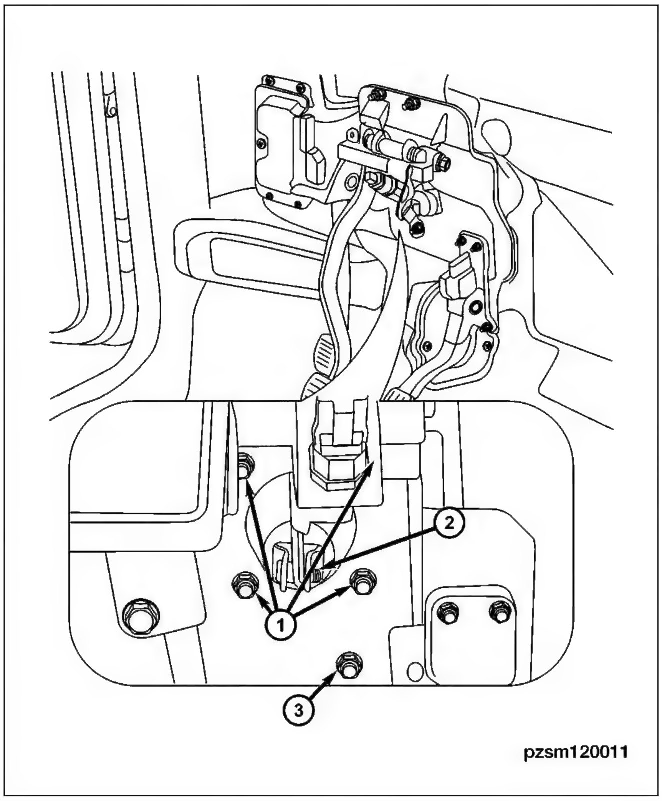
- **Brake Shoes**
  - Inspect the rear brake shoes linings for proper alignment.
  - Inspect the rear brake shoe linings for proper contact across the entire width of the lining.
  - Inspect the rear brake shoe linings for proper contact from the heel to the toe of the lining.
  - Brake shoes with lack of contact at the toe or heel of the brake shoe lining may be improperly ground.
- **Brake Hardware**
  - Clean and inspect the brake support plate.
  - Clean and inspect the brake shoe self-adjustment screw.
  - Apply a thin coat of lubricant or equivalent to the threads of the self-adjuster.
  - Replace the adjuster screw if it is corroded.
  - Inspect the return springs and hold-down spring clips for overheating or damage (Overheating indications are paint discoloration or distorted end coils). Replace the brake hardware if needed.

REAR BRAKE SHOE SPECIFICATIONS	
Standard Brake Shoe Thickness	5 mm
Minimum Brake Shoe Thickness	1 mm

Brake Pedal

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the instrument panel (See Instrument Panel Removal & Installation in Section 15 Body & Accessories).
3. Disconnect the stop lamp switch electrical connector.
4. Remove the stop lamp switch.
5. Remove the pin (2) from the brake booster rod.
6. Remove the nuts (1) attaching the brake pedal and power brake booster to the dash panel.
   (Tighten: Brake pedal/Power brake booster mounting nuts to 25 N·m)
7. Remove the remaining nut attaching the brake pedal (3) to the dash panel.
   (Tighten: Brake pedal/Power brake booster mounting nut to 25 N·m)



8. Remove the brake pedal.
9. Installation is in the reverse order of removal.

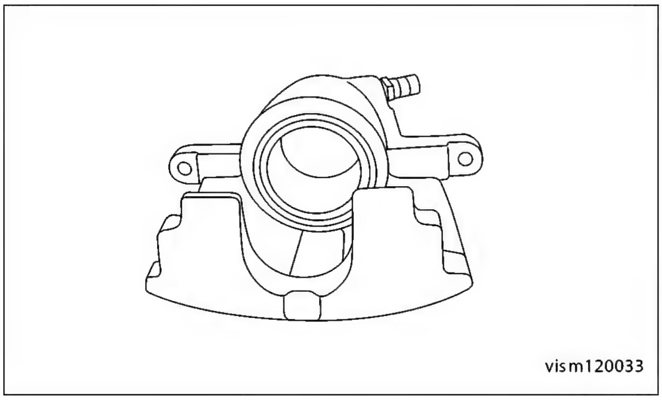
UNIT REPAIR

Front Brake Caliper

Disassembly

Before disassembling the brake caliper, clean and inspect the caliper for the following:

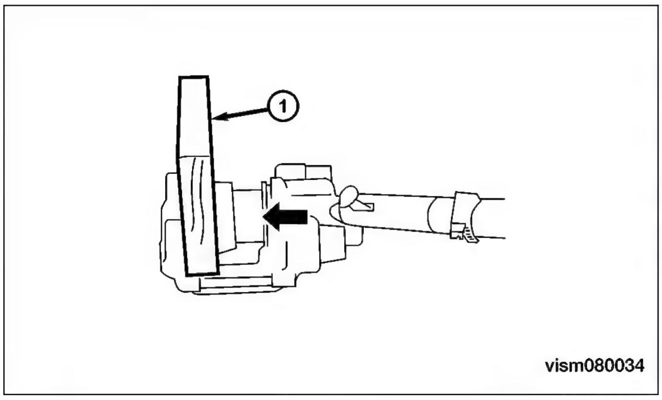
- Cracks or chips on the piston
- Damaged seals
- Cracks in the caliper housing



WARNING!

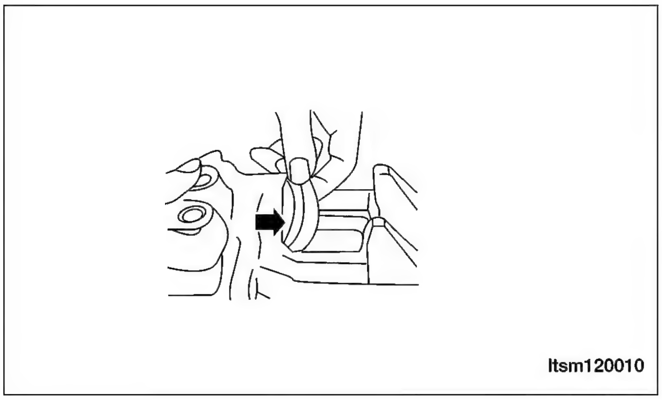
- **Under no condition should high pressure air ever be used to remove a piston from a caliper bore. Personal injury could result from such a practice.**
- **Do not place face or hands near caliper and piston if using compressed air pressure to remove piston. Do not use high pressure.**

1. Place a wooden block (1) in the caliper.
2. Apply low pressure compressed air to the caliper fluid inlet port in short spurts to force the piston out.
3. Remove the piston from the caliper.

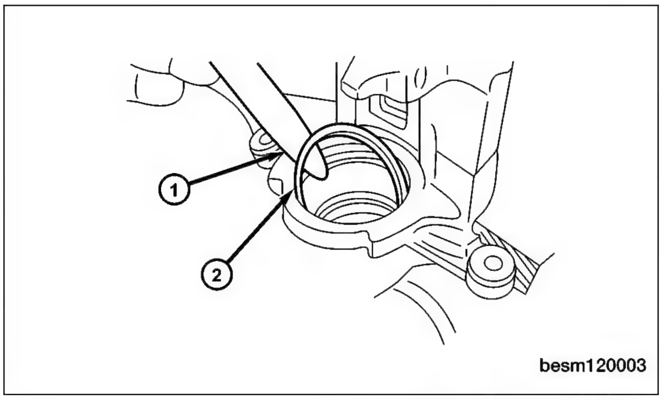


4. Remove the dust boot from the piston and discard it.

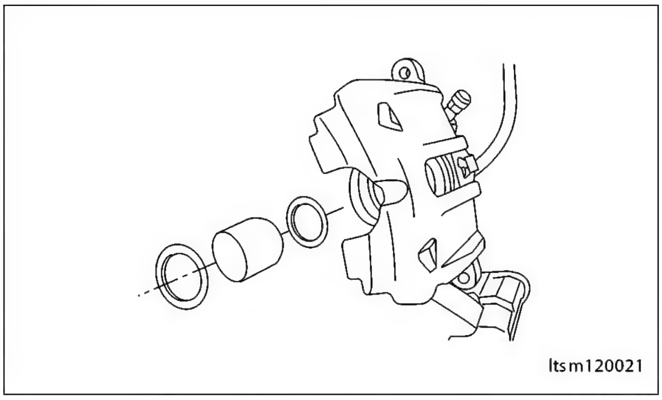
CAUTION:
Do not use a screwdriver or other metal tool for seal removal. Using such tools can scratch the bore or leave burrs on the seal groove edges.



5. Using a soft tool such as a plastic trim stick (1), work the piston seal (2) out of its groove in caliper piston bore. Discard the used seal.

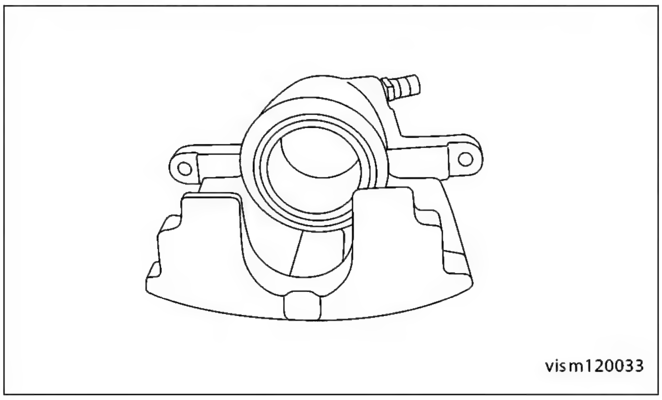


6. Clean the piston bore and drilled passage ways with alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.



Inspection

1. Inspect both the piston and bore for scoring or pitting. Bores that show light scratches or corrosion can usually be cleared of the light scratches or corrosion using crocus cloth.
2. Remove deposits on the piston using a soft brass wire brush or a rough shop towel. Do not clean piston with a polishing or emery cloth because this will damage the chrome-plated surface. Replace the piston if the chrome plated surface is damaged. If the piston is jammed or if the cylinder bores are scored or rusted, replace the complete brake caliper. Remove small, light rust spots in the cylinder bore with a polishing cloth. Remove heavy rust spots in front of the groove for the piston seal using fine-grit emery paper (grit size 380 to 500).
3. Inspect the caliper guide sleeves for smooth operation. Repair and grease caliper sleeves as necessary.



Assembly

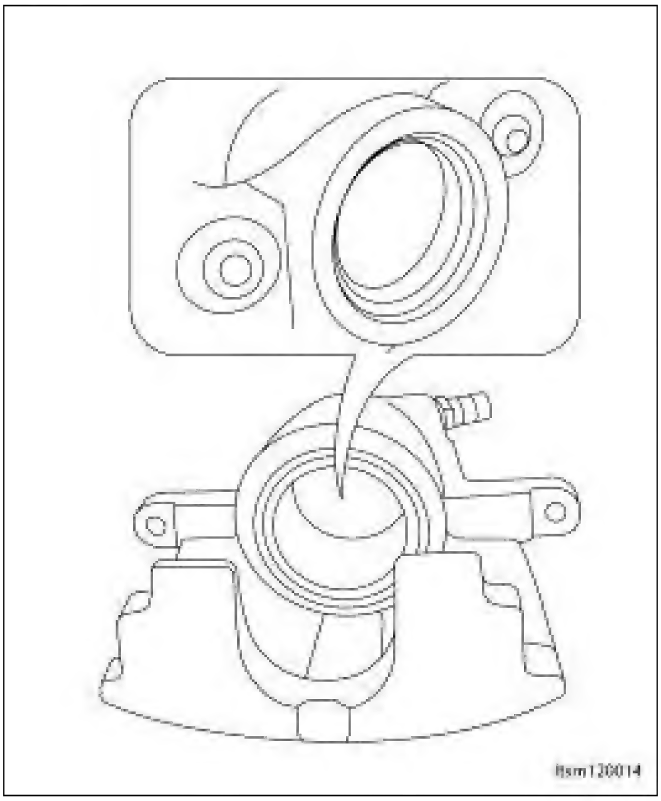
NOTE :

- Always have clean hands when assembling a brake caliper.
- Always use fresh, clean brake fluid when assembling a brake caliper.
- Never use an old piston seal.
- Bleed the brakes as necessary.

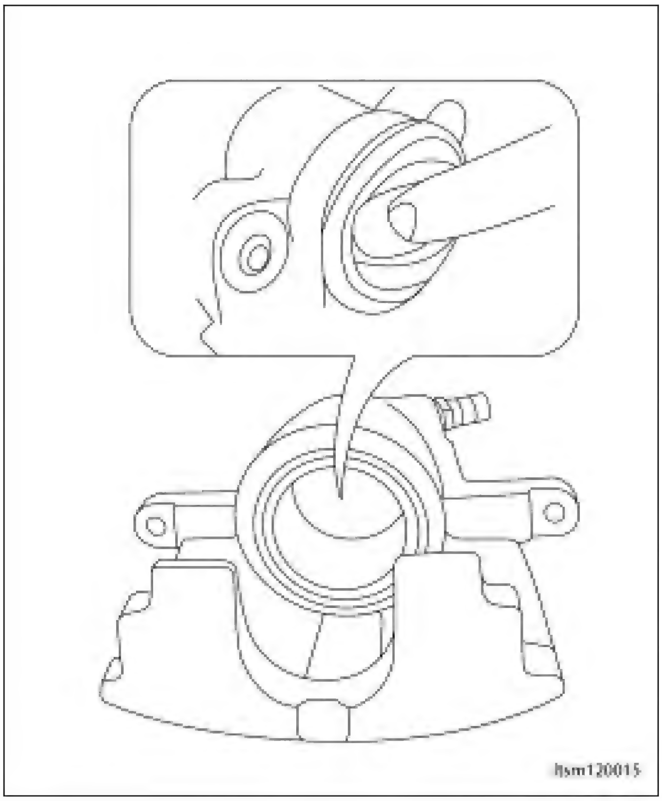
Perform the following procedure to assemble the brake caliper:

1. Lubricate the caliper piston, piston seals and piston bore with clean brake fluid.
2. Install the new piston seal into the seal groove.

NOTE :
Verify seal is fully seated into seal groove and not twisted.

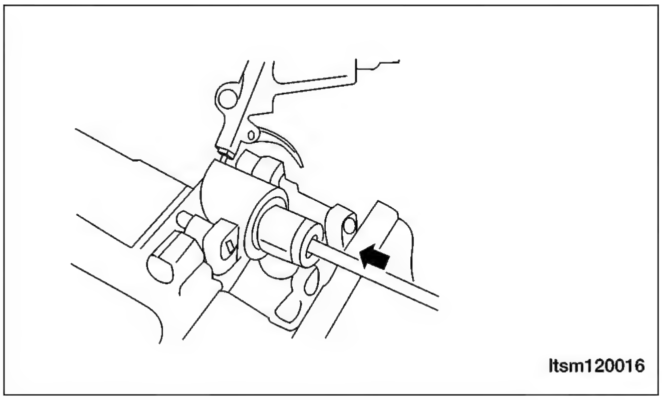


3. Install the new dust boot on the caliper piston and seat the dust boot lip into the piston groove.
4. Stretch the dust boot rearward to straighten the boot folds, then move the boot forward until the fold snaps into place.



5. Install the piston into the caliper bore and press the piston down to the bottom of the caliper bore by hand or with the handle of a hammer in the direction shown.

   NOTE: Apply a small amount of air pressure into the caliper to help during assembly.



CAUTION:
When assembling, the force applied to the piston to seat it in the bore, must be applied uniformly to avoid cocking and binding of the piston.

6. Seat the dust boot in caliper.
7. Install the new caliper bleed screw.
8. Install the caliper (See Front Brake Caliper Removal & Installation in Section 12 Brakes).

ANTILOCK BRAKES

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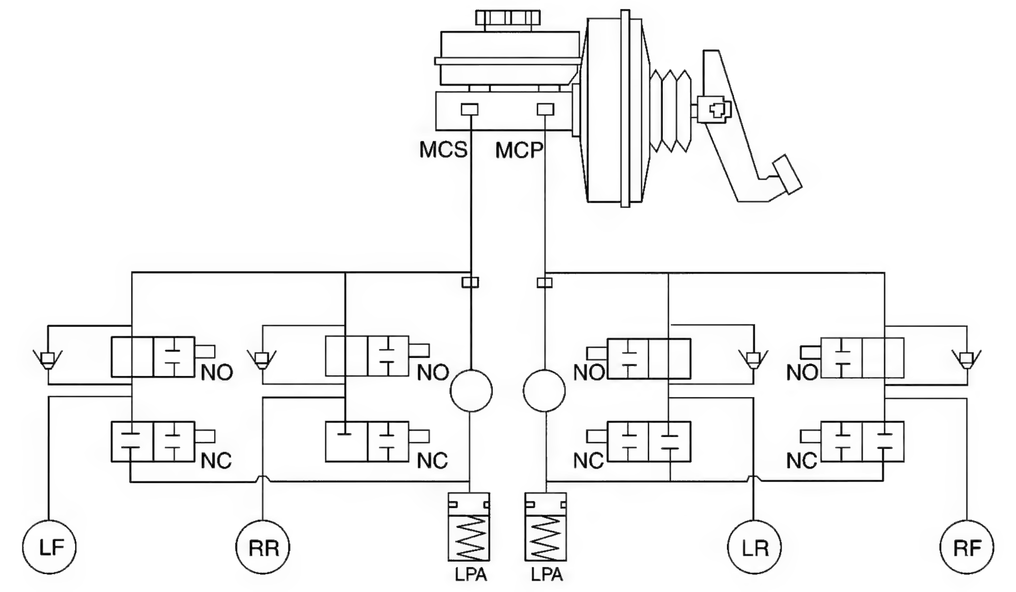
GENERAL INFORMATION

Description



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The Antilock Brake System (ABS) uses components of the base brake system, but also features the following components:

- Hydraulic Control Unit (HCU) and Antilock Brake System (ABS) Module
- Wheel Speed Sensors - Four sensors (one sensor at each wheel making it a four-channel system)

The purpose of the ABS is to prevent wheel lockup under braking conditions on virtually any type of road surface. Antilock braking is desirable because a vehicle that is stopped without locking the wheels retains directional stability and some steering capability. This allows the driver to retain greater control of the vehicle during braking.

Operation

ABS Braking

- ABS operation is activated when the ABS hydraulic control module senses a wheel lock-up condition. If a wheel lock-up is detected during a brake application, the brake system enters the ABS mode. During ABS braking, hydraulic pressure in the four wheel circuits is modulated to prevent any wheel from locking. Each wheel circuit is designed with a set of electric solenoids to allow modulation. The system can build and release pressure at each wheel, depending on signals generated by the wheel speed sensors at each wheel and received at the ABS hydraulic control module.

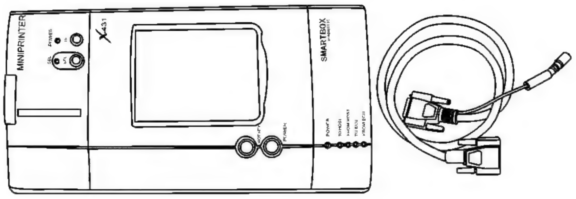
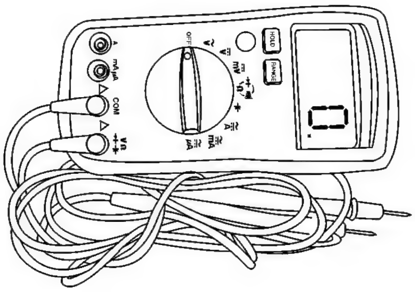
- There are a few performance characteristics of the ABS that may at first seem abnormal, but in fact are normal. These characteristics are described below.
  - If the electrical system malfunctions, the Fail-Safe function is activated, the ABS becomes inoperative and the ABS warning lamp turns on.
  - During ABS operation, the brake pedal may vibrate lightly and a mechanical noise may be heard. This is normal.
  - Stopping distance may be longer than that of vehicles without ABS when vehicle drives on rough, gravel, or snow-covered (fresh, deep snow) roads.

Specifications

Torque Specifications

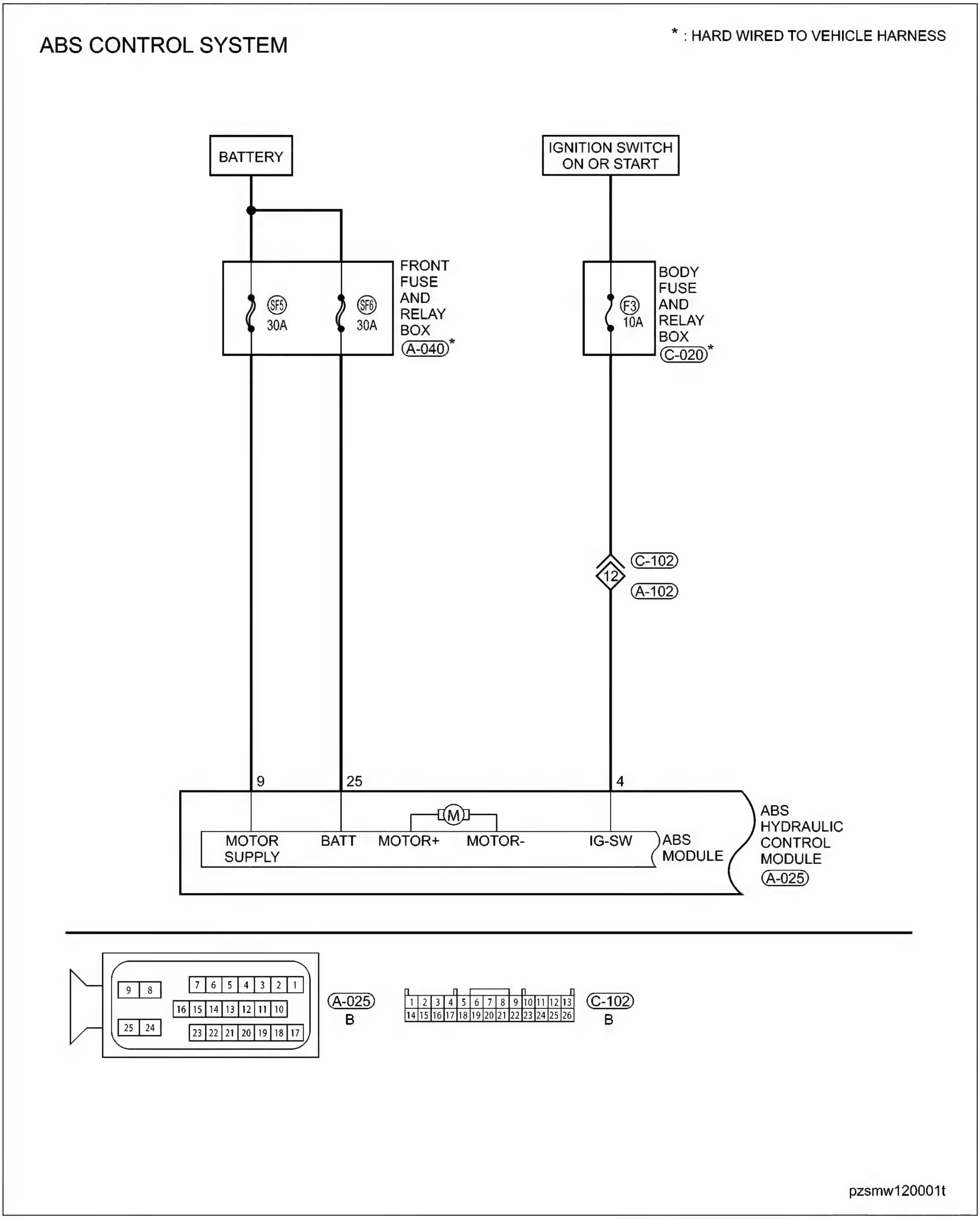
DESCRIPTION	TORQUE (N·m)
ABS Mounting Bolt (To Bracket)	10
ABS Mounting Bracket Screw (To Frame)	20
ABS Mounting Bracket Screw and Nut (To Frame)	20
ABS Wheel Speed Sensor Mounting Bolt	10
Brake Tube Nuts	16 ± 3
Wheel Mounting Nuts	110 ± 10

Special Tools

Diagnostic Scan Tool X-431	 besm030001
Digital Multimeter Fluke 15B & 17B	 besm030002

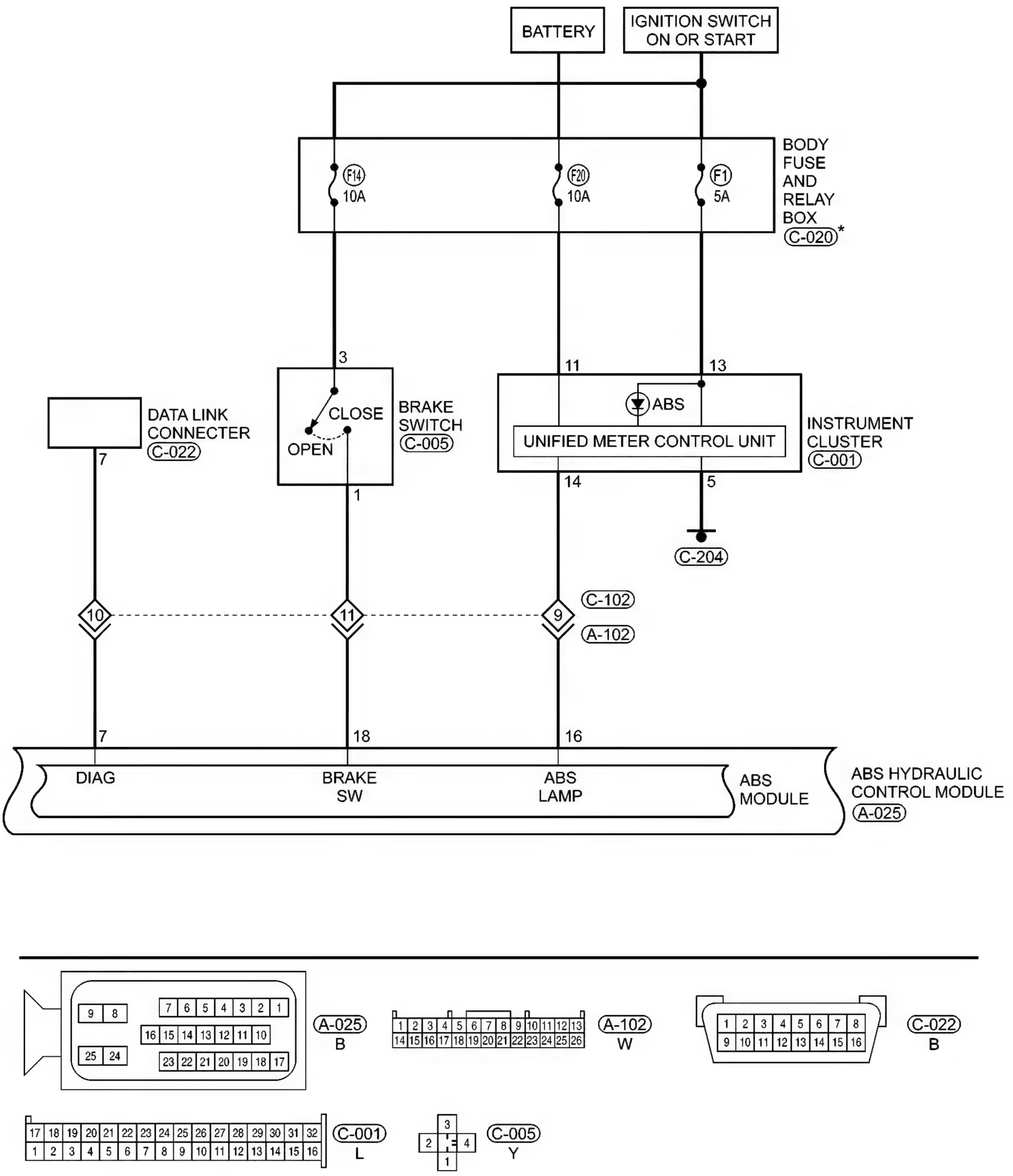
Electrical Schematics

Antilock Brake System (Page 1 of 3)


ABS CONTROL SYSTEM
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
SF5 30A
SF6 30A
FRONT FUSE AND RELAY BOX A-040*
F3 10A
BODY FUSE AND RELAY BOX C-020*
12
C-102
A-102
9
25
4
MOTOR SUPPLY
BATT
MOTOR+
M
MOTOR-
IG-SW
ABS MODULE
ABS HYDRAULIC CONTROL MODULE A-025
A-025 B
C-102 B
pzsmw120001t

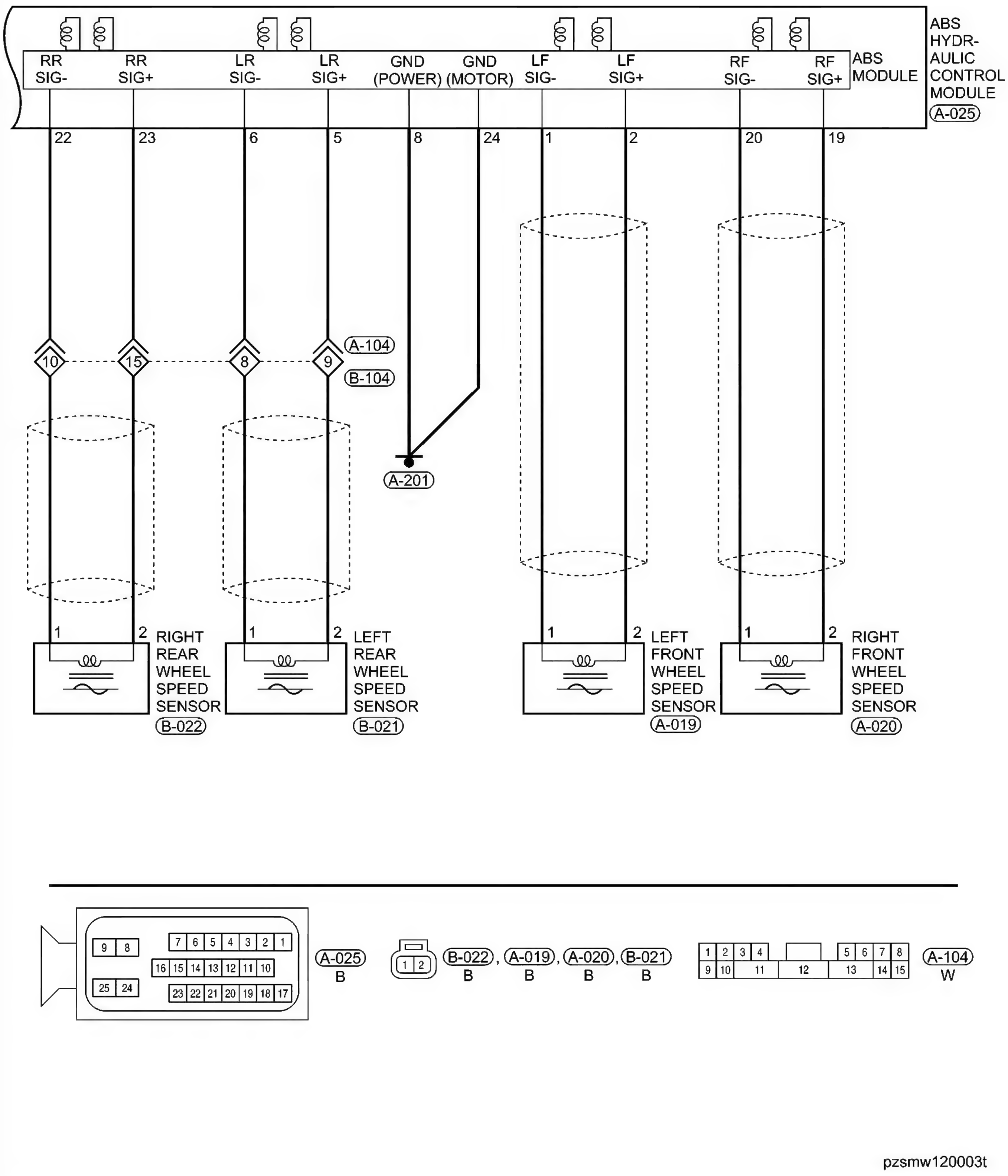
Antilock Brake System (Page 2 of 3)

* : HARD WIRED TO VEHICLE HARNESS


BATTERY
IGNITION SWITCH ON OR START
F14 10A
F20 10A
F1 5A
BODY FUSE AND RELAY BOX
C-020*
3
11
13
DATA LINK CONNECTER
C-022
7
CLOSE
OPEN
BRAKE SWITCH
C-005
1
ABS
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
14
5
C-204
10
11
9
C-102
A-102
7
18
16
DIAG
BRAKE SW
ABS LAMP
ABS MODULE
ABS HYDRAULIC CONTROL MODULE
A-025
A-025 B
A-102 W
C-022 B
C-001 L
C-005 Y

pzsmw120002t

Antilock Brake System (Page 3 of 3)


ABS HYDR-AULIC CONTROL MODULE
A-025
ABS MODULE
RR SIG-
RR SIG+
LR SIG-
LR SIG+
GND (POWER)
GND (MOTOR)
LF SIG-
LF SIG+
RF SIG-
RF SIG+
22
23
6
5
8
24
1
2
20
19
10
15
8
9
A-104
B-104
A-201
1
2
RIGHT REAR WHEEL SPEED SENSOR
B-022
1
2
LEFT REAR WHEEL SPEED SENSOR
B-021
1
2
LEFT FRONT WHEEL SPEED SENSOR
A-019
1
2
RIGHT FRONT WHEEL SPEED SENSOR
A-020
9 8 7 6 5 4 3 2 1
16 15 14 13 12 11 10
25 24 23 22 21 20 19 18 17
A-025
B
1 2
B-022, A-019, A-020, B-021
B B B B
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15
A-104
W
pzsmw120003t

Antilock Brake System (ABS) Module Connector Pin-Out Table

ABS Hydraulic Control Module Connector Pin-Out Table

PIN	CIRCUIT IDENTIFICATION	PIN	CIRCUIT IDENTIFICATION
1	Left Front Wheel Speed Sensor (-)	14	-
2	Left Front Wheel Speed Sensor (+)	15	-
3	-	16	ABS Lamp
4	Ignition Switch	17	-
5	Left Rear Wheel Speed Sensor (+)	18	Brake Switch
6	Left Rear Wheel Speed Sensor (-)	19	Right Front Wheel Speed Sensor (+)
7	Diagnostic Link K	20	Right Front Wheel Speed Sensor (-)
8	GND	21	-
9	Continuous Supply Voltage (Motor)	22	Right Rear Wheel Speed Sensor (-)
10	-	23	Right Rear Wheel Speed Sensor (+)
11	-	24	GND
12	-	25	Continuous Supply Voltage
13	-	-	-

DIAGNOSIS & TESTING

Diagnostic Help

1. The X-431 scan tool connects to the Data Link Connector (DLC) and communicates with the vehicle electronic modules through the K data circuit.
2. Confirm that the malfunction is current and carry-out the diagnostic tests and repair procedures.
3. If the Diagnostic Trouble Code (DTC) cannot be deleted, it is a current fault.
4. Use a digital multimeter to perform voltage readings on electronic systems.
5. Refer to any Technical Bulletins that may apply to the failure.
6. Visually inspect the related electrical wiring harness.
7. Perform a voltage drop test on the related circuits between the suspected component and the ABS module.
8. Inspect and clean all ECM, ABS, engine, and chassis grounds that are related to the most current DTC.
9. If numerous trouble codes were set, use an electrical schematic and look for any common ground circuits or voltage supply circuits that may apply to the DTC.
10. For any wheel speed sensor DTCs, inspect for dirt/metal debris.
11. Use the scan tool to perform a System Test if one applies to the failed component.

Intermittent DTC Troubleshooting

If the failure is intermittent perform the following:

- Check for loose connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Monitor the scan tool data relative to this circuit.
- Wiggle the related electrical wiring harness and connectors while looking for an interrupted signal on the affected circuit.
- If possible, try to duplicate the conditions under which the DTC set.
- Look for the data to change or for the DTC to reset during the wiggle test.
- Look for broken, bent, pushed out or corroded terminals.
- Inspect the sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign material.
- A data recorder, and/or oscilloscope should be used to help diagnose intermittent conditions.
- Remove the ABS module from the troubled vehicle and install in a new vehicle and test. If the DTC can not be deleted, the ABS module is malfunctioning. If the DTC can be deleted, return the ABS module to the original vehicle.

Ground Inspection

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This added resistance can affect the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can affect the circuit. Perform the following when inspecting a ground connection:

1. Remove the ground bolt or screw.
2. Inspect all mating surface for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for ″add-on″ accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are crimped to one eyelet, make sure no excess wire insulation has been crimped creating a bad ground.

Diagnostic Tools

- Diagnostic Scan Tool X-431
- Digital Multimeter
- Jumper Wire

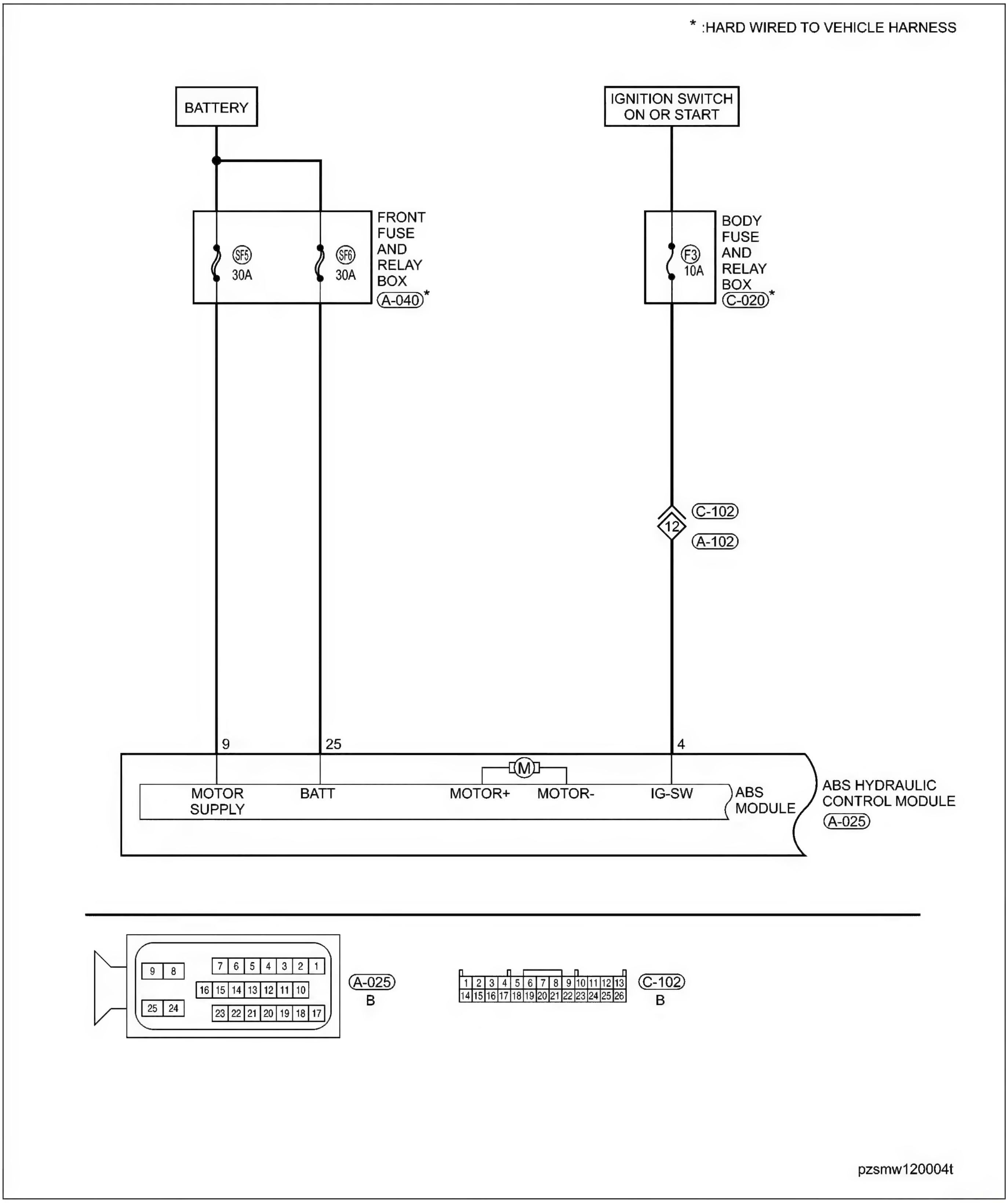
Diagnostic Trouble Code (DTC) List

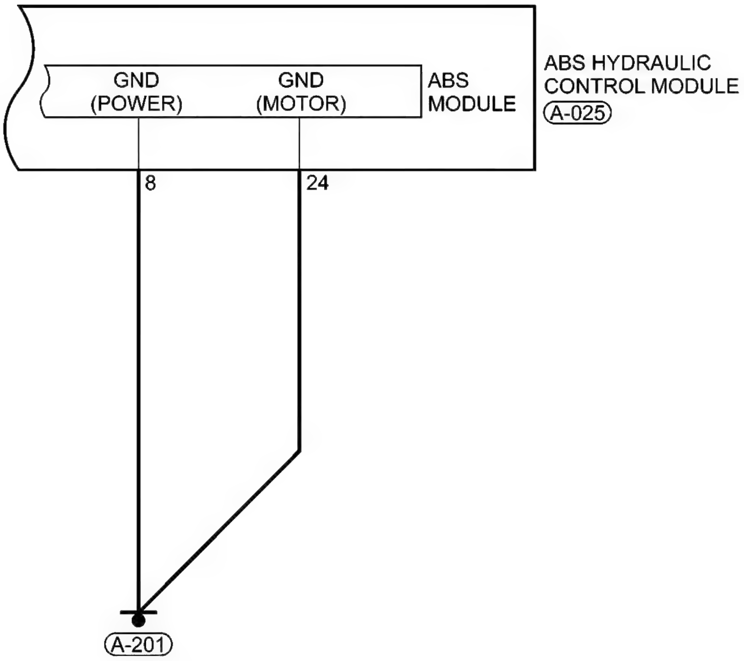
Antilock Brake System DTC List

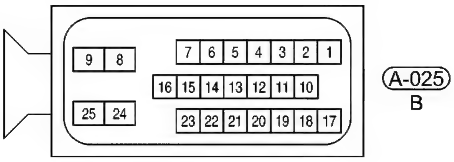
DTC	DTC DEFINITION
C1101	Battery Voltage High
C1102	Battery Voltage Low
C1200	Left Front Wheel Speed Sensor Circuit Open or Shorted
C1201	Left Front Wheel Speed Sensor or Sensor Ring
C1202	Left Front Wheel Speed Sensor Gap Error
C1203	Right Front Wheel Speed Sensor Circuit Open or Shorted
C1204	Right Front Wheel Speed Sensor or Sensor Ring
C1205	Right Front Wheel Speed Sensor Gap Error
C1206	Left Rear Wheel Speed Sensor Circuit Open or Shorted
C1207	Left Rear Wheel Speed Sensor or Sensor Ring
C1208	Left Rear Wheel Speed Sensor Gap Error
C1209	Right Rear Wheel Speed Sensor Circuit Open or Shorted
C1210	Right Rear Wheel Speed Sensor or Sensor Ring
C1211	Right Rear Wheel Speed Sensor Gap Error
C1604	ECU Defect, Internal Errors or Solenoid Fault
C2112	Solenoid Fuse or Solenoid Relay Fault
C2402	Motor Fuse or Motor Fault

Diagnostic Trouble Code (DTC) Tests

C1101 - Battery Voltage High
C1102 - Battery Voltage Low


* :HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
SF5 30A
SF6 30A
FRONT FUSE AND RELAY BOX
A-040*
F3 10A
BODY FUSE AND RELAY BOX
C-020*
C-102
12
A-102
9
25
4
M
MOTOR SUPPLY
BATT
MOTOR+
MOTOR-
IG-SW
ABS MODULE
ABS HYDRAULIC CONTROL MODULE
A-025
9 8 7 6 5 4 3 2 1
16 15 14 13 12 11 10
25 24 23 22 21 20 19 18 17
A-025 B
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
C-102 B
pzsmw120004t


GND
(POWER)
GND
(MOTOR)
ABS
MODULE
ABS HYDRAULIC
CONTROL MODULE
A-025
8
24
A-201


9
8
7
6
5
4
3
2
1
16
15
14
13
12
11
10
25
24
23
22
21
20
19
18
17
A-025
B

pzsmw120005t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
C1101	Battery voltage high	Ignition switch: ON	ABS module detected that the battery voltage is excessively high.	• Charging system • ABS module
C1102	Battery voltage low		ABS module detected that the battery voltage is excessively low.	• Charging system • Harness is open or shorted • Battery • ABS module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Start the engine and warm it to normal operating temperature.
- With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).
- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information.
- Erase all codes and test drive the vehicle to verify the repair is complete.

NOTE :
Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

NOTE :
Inspect the fuses. If an open fuse is found, use the electrical schematics as a guide and inspect the wiring and connectors for damage.

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground connection A-201 (See Ground Inspection in Section 12 Brakes).
- Inspect the ground connection A-201 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace the ground connection.

2. CHECK ABS MODULE POWER SUPPLY

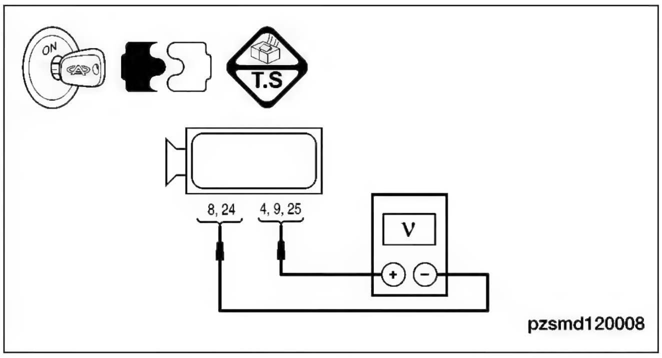
- Turn ignition switch off.
- Disconnect the ABS module electrical connector.
- Turn ignition switch on.
- Start the engine.

- Check the ABS module power supply voltage between terminals 4, 9, 25 and terminals 8, 24 in the ABS module electrical connector A-025, terminal side.

Is the voltage between 9.4 and 17 V?

Yes >> Replace the ABS module.

No >> If the voltage is less than 9.4 V, go to step 3.
If the voltage is more than 17 V, go to step 6.



3. CHECK SYSTEM VOLTAGE

- Turn ignition switch off.
- Connect the ABS module connector.
- Start the engine, raise the engine speed to over 1000 RPM.
- Measure the charging voltage at the battery positive and negative terminals.

Is the voltage less than 9.4 V?

Yes >> Check the charging system.

No >> Go to the next step.

4. CHECK THE BATTERY

- Maintain the engine speed to over 1000 RPM for a few minutes.
- Turn ignition switch off.
- Measure the voltage drop at the battery positive and negative terminals while cranking the engine.
- Battery voltage should be more than approximately 9.4 V.

Is the check result normal?

Yes >> Go to the next step.

No >> Charge or replace the battery.

5. CHECK ABS MODULE POWER SUPPLY CIRCUIT

- Measure the continuity between the ABS module terminals 9 & 25 and the battery positive terminal.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Check the fuse.
Check the harness.
Check all related components.

6. CHECK SYSTEM VOLTAGE

- Maintain engine speed to over 1000 RPM.
- Measure the charging voltage at the battery positive and negative terminals.

Is the voltage more than 17 V?

Yes >> Replace the AC generator.

No >> Go to the next step.

7. CHECK DTC

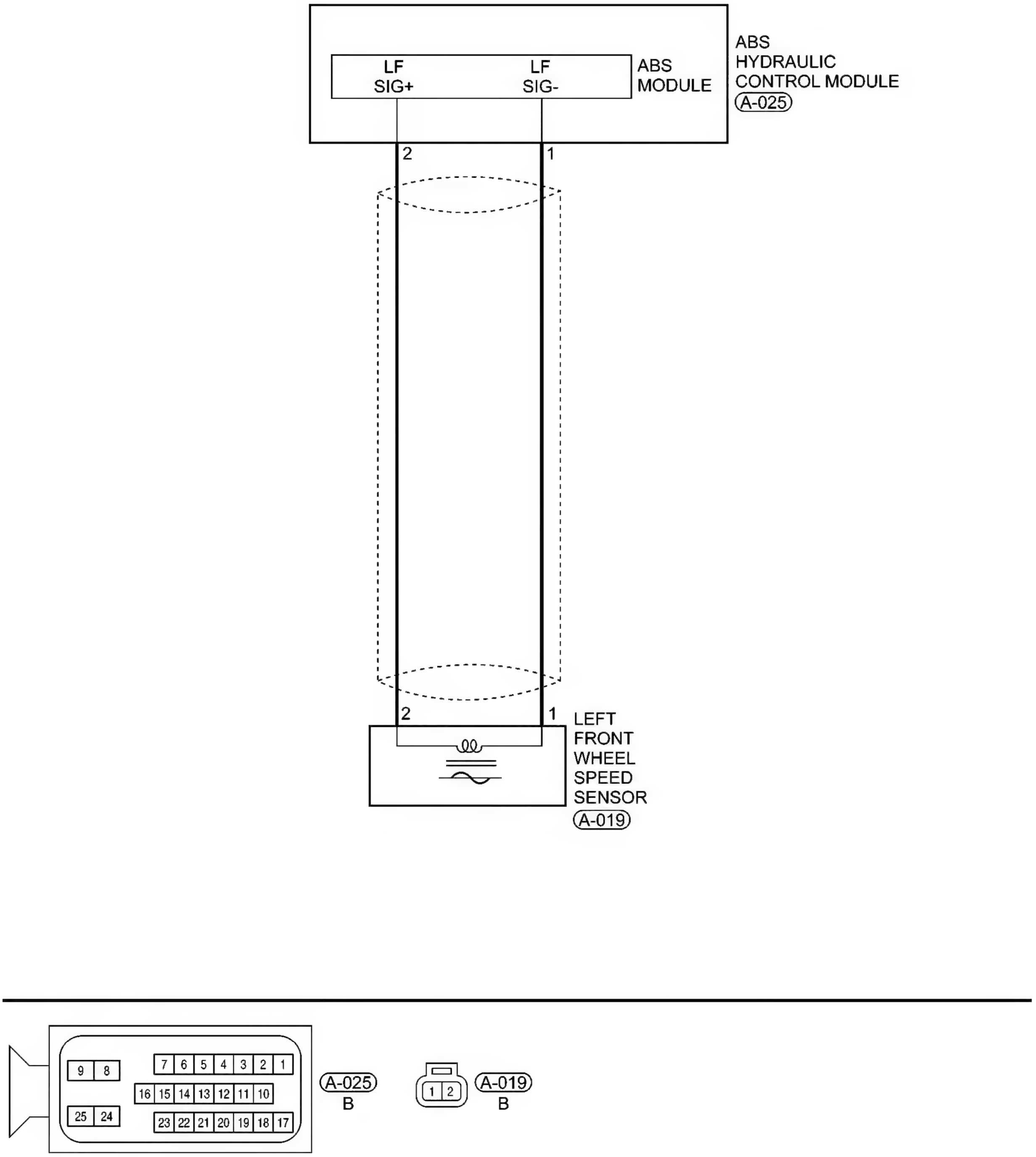
- With the X-431 scan tool, read the ABS module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC C1101 or DTC C1102 still present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Erase all codes and test drive the vehicle to verify the repair is complete.

C1200 - Left Front Wheel Speed Sensor Circuit Open or Shorted


LF
SIG+
LF
SIG-
ABS
MODULE
ABS
HYDRAULIC
CONTROL MODULE
A-025
2
1
2
1
LEFT
FRONT
WHEEL
SPEED
SENSOR
A-019
9
8
7
6
5
4
3
2
1
16
15
14
13
12
11
10
25
24
23
22
21
20
19
18
17
A-025
B
1
2
A-019
B

pzsmw120006t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
C1200	Left front wheel speed sensor circuit open or shorted	• Ignition switch: ON • Vehicle: Running	ABS module detected that the Left Front wheel speed sensor input signal to ABS module is open or shorted.	• Left Front wheel speed sensor • Harness is open or shorted • ABS module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Cycle the ignition switch from off to on.
- Start the engine and warm it to normal operating temperature.
- Turn ignition switch off and wait for a few seconds.
- Start the engine. With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).

NOTE :

Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).
- Erase all codes and test drive the vehicle to verify the repair is complete.

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK ABS MODULE DTC

- With the scan tool select: View ABS Data Stream.
- With an assistant driving the vehicle, check the following data stream list items while driving the vehicle over 40 km/h (25 mph).
  - Left Front Wheel Speed
  - Right Front Wheel Speed
  - Left Rear Wheel Speed
  - Right Rear Wheel Speed
- With the scan tool, read active DTCs in the ABS module.

Is DTC C1200 present and the Left Front Wheel Speed signal abnormal?

Yes >> Go to the next step.

No >> The condition that caused this DTC to set is currently not present (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).

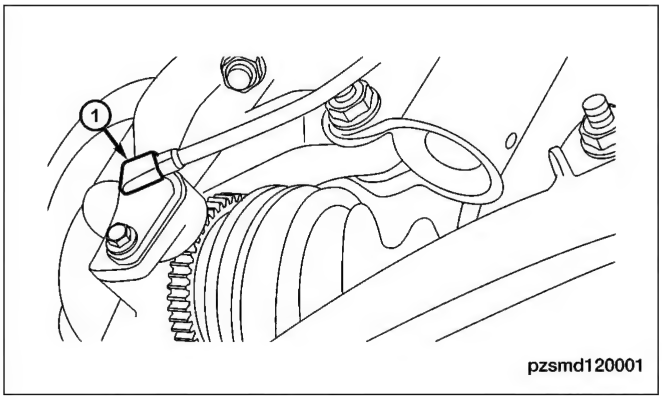
2. CHECK LEFT FRONT WHEEL SPEED SENSOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the wheel speed sensor (1) electrical connector.
- Inspect the wheel speed sensor electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



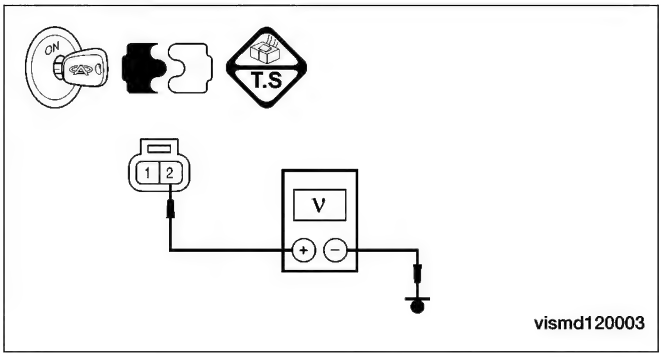
3. CHECK LEFT FRONT WHEEL SPEED SENSOR REFERENCE SIGNAL CIRCUIT

- Turn ignition switch on.
- Measure the sensor reference voltage between terminal 2 of the wheel speed sensor connector A-019, terminal side and ground.
- Voltage should exist (less than 1.0 V).

Is the proper voltage present?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to ground or short to battery in connector or harness.



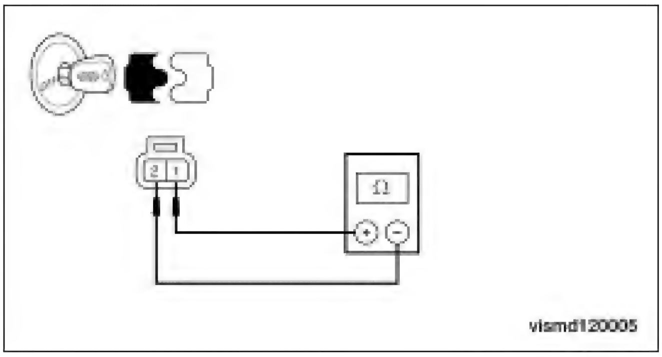
4. CHECK LEFT FRONT WHEEL SPEED SENSOR RESISTANCE

- Check the wheel speed sensor resistance between the sensor terminals 1 and 2, component side.

Is the sensor resistance 700 - 1500 ohms?

Yes >> Go to the next step.

No >> Replace the Left Front wheel speed sensor.



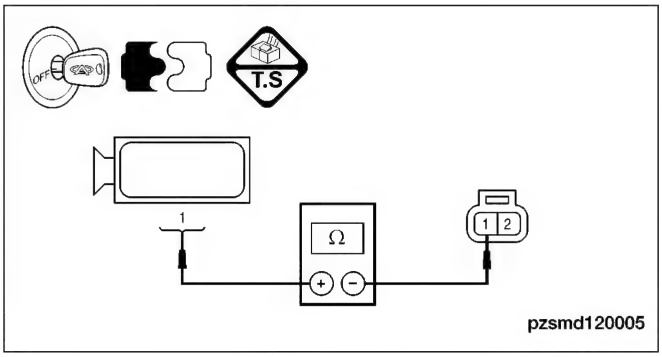
5. CHECK LEFT FRONT WHEEL SPEED SENSOR GROUND CIRCUIT FOR AN OPEN

- Turn ignition switch off.
- Disconnect the ABS module electrical connector.
- Check the continuity between terminal 1 of the ABS module connector A-025, and terminal 1 of the Left Front wheel speed sensor connector A-019, terminal side.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open.



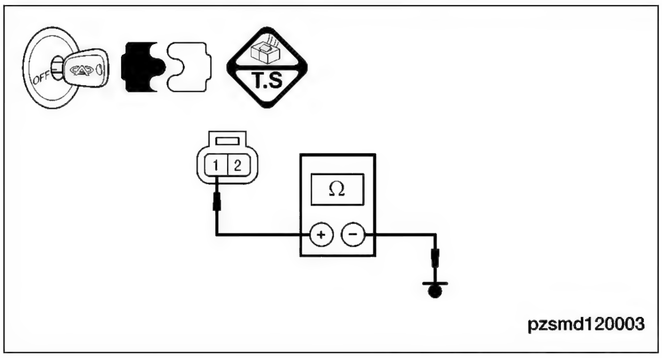
6. CHECK LEFT FRONT WHEEL SPEED SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND

- Check the continuity between terminal 1 of the Left Front wheel speed sensor connector A-019, terminal side and ground.
- Continuity should not exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for a short to ground.



7. CHECK LEFT FRONT WHEEL SPEED SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE

- Check the voltage between terminal 1 of the Left Front wheel speed sensor connector A-019, terminal side and ground.
- Voltage should not exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for a short to battery.

8. CHECK DTC

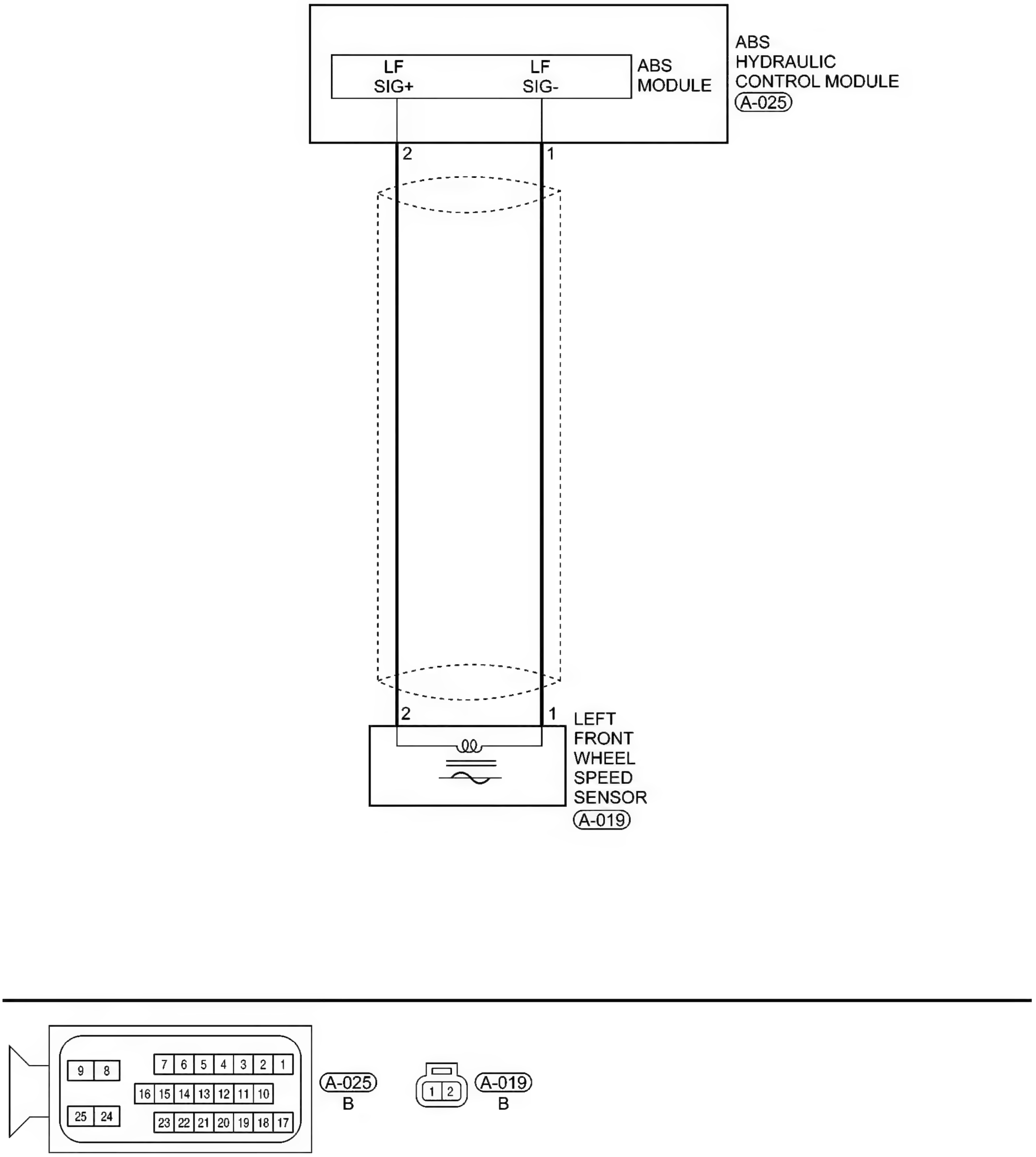
- With the X-431 scan tool, read the ABS module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC C1200 present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Erase all codes and test drive the vehicle to verify the repair is complete.

C1202 - Left Front Wheel Speed Sensor Gap Error


LF
SIG+
LF
SIG-
ABS
MODULE
ABS
HYDRAULIC
CONTROL MODULE
A-025
2
1
2
1
LEFT
FRONT
WHEEL
SPEED
SENSOR
A-019
9
8
7
6
5
4
3
2
1
16
15
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10
25
24
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22
21
20
19
18
17
A-025
B
1
2
A-019
B

pzsmw120006t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
C1202	Left front wheel speed sensor gap error	With the vehicle speed above 40 km/h (25 mph)	When the Left Front wheel speed sensor input signal to the Antilock Brake System (ABS) module is excessive variation while vehicle speed is above 40 km/h (25 mph), or different wheel speed signal during acceleration, or sensed wheel speed is different from other wheels.	• Left Front wheel speed sensor • Bearing clearance • ABS module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Cycle the ignition switch from off to on.
- Start the engine and warm it to normal operating temperature.
- Turn the ignition switch off and wait for a few seconds.
- Start the engine. With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).

NOTE :
Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

NOTE :
If a DTC concerning a wheel speed sensor circuit being open or shorted is present, that DTC must be repaired before continuing.

- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).
- Erase all codes and test drive the vehicle to verify the repair is complete.
- This DTC must be active for the results of this test to be valid.

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground connection A-201 (See Ground Inspection in Section 12 Brakes).
- Inspect the ground connection A-201 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace the ground connection.

2. CHECK ABS MODULE DTC

- With the scan tool select: View ABS Data Stream.
- With an assistant driving the vehicle, check the following data stream list items while driving the vehicle over 40 km/h (25 mph).
  - Left Front Wheel Speed
  - Right Front Wheel Speed
  - Left Rear Wheel Speed
  - Right Rear Wheel Speed
- With the scan tool, read active DTCs in the ABS module.

Is DTC C1202 present and the Left Front Wheel Speed signal abnormal?

Yes >> Go to the next step.

No >> The condition that caused this DTC to set is currently not present (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).

3. CHECK AND ADJUST TIRE PRESSURE

- Turn ignition switch off.
- Check and adjust the tire pressure in the Left Front tire (check for a slow leak).
- Check and adjust all other tire pressures.
- Inspect for mismatched tires on the vehicle.

Is the Left Front tire improperly inflated or mismatched tires on the vehicle?

Yes >> Repair the Left Front tire as necessary.

No >> Go to the next step.

4. CHECK CLEARANCE BETWEEN LEFT FRONT WHEEL SPEED SENSOR AND SENSOR RING

- Inspect the wheel speed sensor and sensor ring for the following conditions that would result in an incorrect signal:
    - Damaged sensor
    - Loose sensor
    - Foreign material
- Check the clearance between Left Front wheel speed sensor and sensor ring.
- 1 - 2 mm should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Clean/replace the wheel speed sensor or sensor ring.
Reinstall the sensor and adjust the clearance as necessary.

5. CHECK LEFT FRONT WHEEL BEARING FOR EXCESSIVE RUNOUT OR CLEARANCE

- Inspect the Left Front wheel bearing for excessive runout or clearance before replacing the wheel bearing assembly.
- Replace the Left Front wheel bearing assembly (See Front Hub and Bearing Removal & Installation in Section 09 Driveline & Axle).

WARNING!

To avoid personal injury or death, verify vehicle braking before road testing.Connect the module and wheel speed sensor connectors.

- Road test the vehicle over 40 km/h (25 mph).

NOTE :
Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

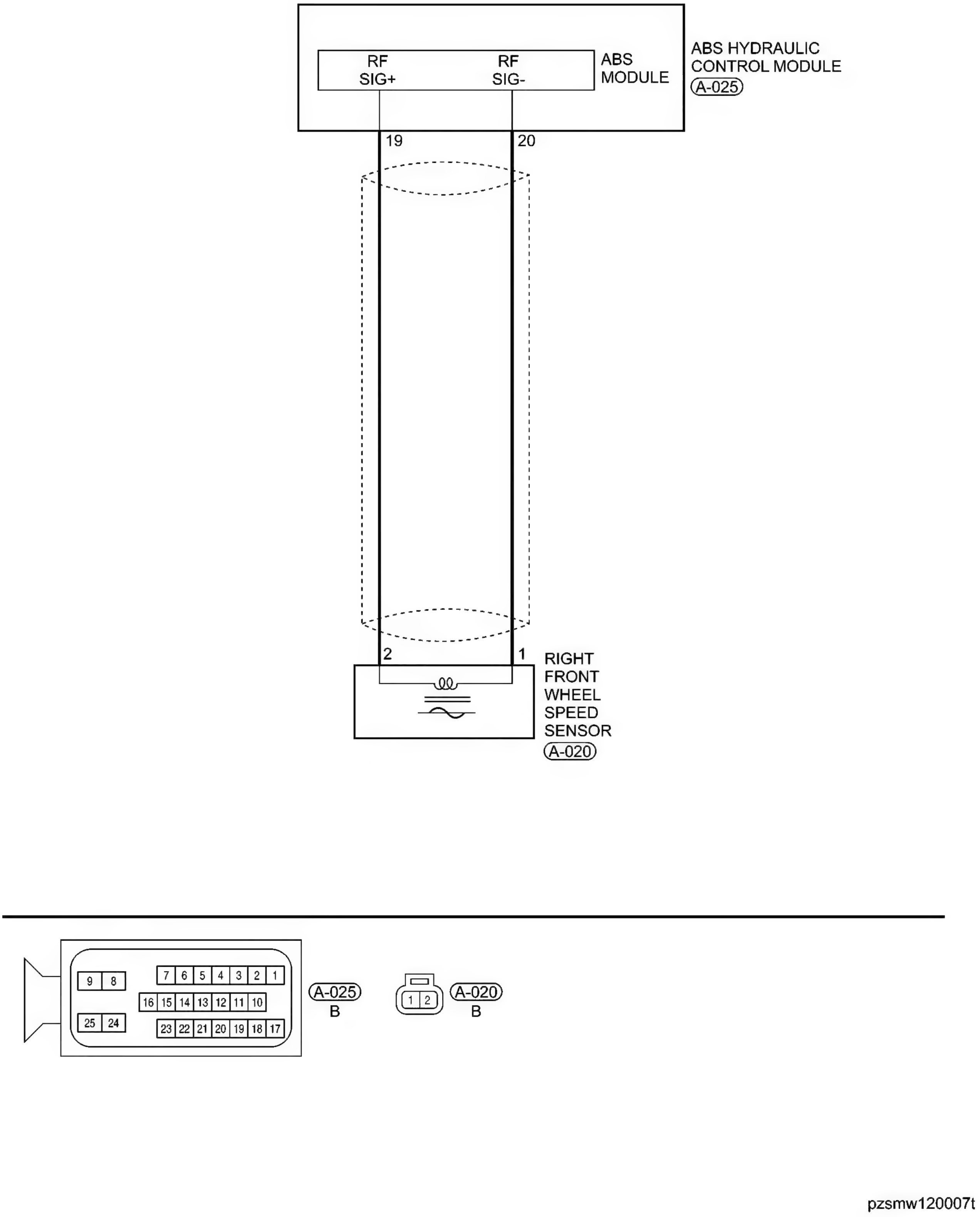
- With the X-431 scan tool, read ABS DTCs.

Is DTC C1202 still present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

C1203 - Right Front Wheel Speed Sensor Circuit Open or Shorted


RF SIG+
RF SIG-
ABS MODULE
ABS HYDRAULIC CONTROL MODULE
A-025
19
20
2
1
RIGHT FRONT WHEEL SPEED SENSOR
A-020
9 8
7 6 5 4 3 2 1
16 15 14 13 12 11 10
25 24
23 22 21 20 19 18 17
A-025
B
1 2
A-020
B
pzsmw120007t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
C1203	Right front wheel speed sensor circuit open or shorted	• Ignition switch: ON • Vehicle: Running	ABS module detected that the Right Front wheel speed sensor input signal to ABS module is open or shorted.	• Right Front wheel speed sensor • Harness is open or shorted • ABS module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Cycle the ignition switch from off to on.
- Start the engine and warm it to normal operating temperature.
- Turn ignition switch off and wait for a few seconds.
- Start the engine. With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).

NOTE :

Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).
- Erase all codes and test drive the vehicle to verify the repair is complete.

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK ABS MODULE DTC

- With the scan tool select: View ABS Data Stream.
- With an assistant driving the vehicle, check the following data stream list items while driving the vehicle over 40 km/h (25 mph).
  - Left Front Wheel Speed
  - Right Front Wheel Speed
  - Left Rear Wheel Speed
  - Right Rear Wheel Speed
- With the scan tool, read active DTCs in the ABS module.

Is DTC C1203 present and the Right Front Wheel Speed signal abnormal?

Yes >> Go to the next step.

No >> The condition that caused this DTC to set is currently not present (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).

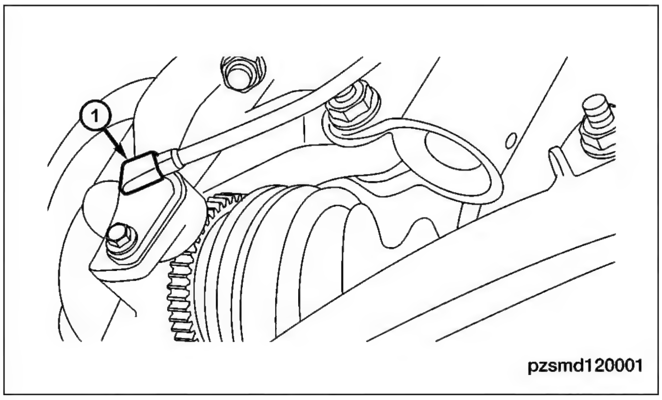
2. CHECK RIGHT FRONT WHEEL SPEED SENSOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the wheel speed sensor (1) electrical connector.
- Inspect the wheel speed sensor electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



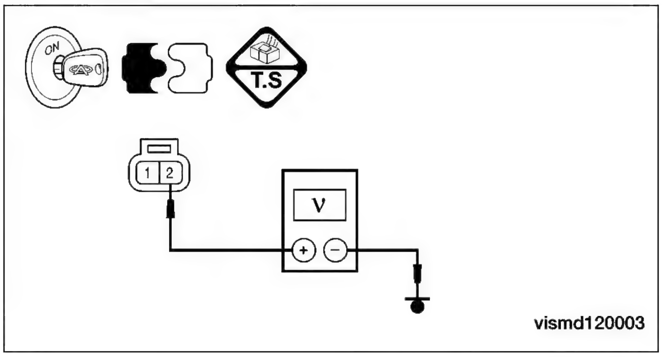
3. CHECK RIGHT FRONT WHEEL SPEED SENSOR REFERENCE SIGNAL CIRCUIT

- Turn ignition switch on.
- Measure the sensor reference voltage between terminal 2 of the wheel speed sensor connector A-020, terminal side and ground.
- Voltage should exist (less than 1.0 V).

Is the proper voltage present?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to ground or short to battery in connector or harness.



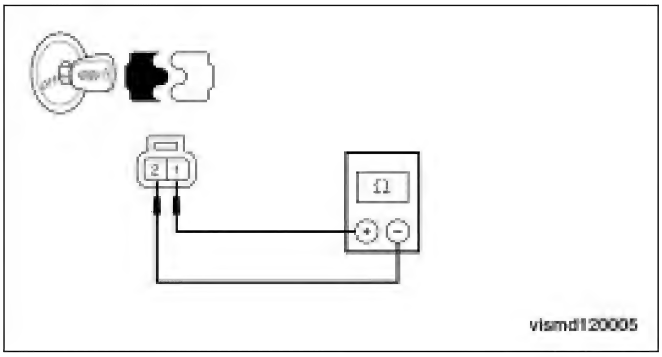
4. CHECK RIGHT FRONT WHEEL SPEED SENSOR RESISTANCE

- Check the wheel speed sensor resistance between the sensor terminals 1 and 2, component side.

Is the sensor resistance 700 - 1500 ohms?

Yes >> Go to the next step.

No >> Replace the Right Front wheel speed sensor.



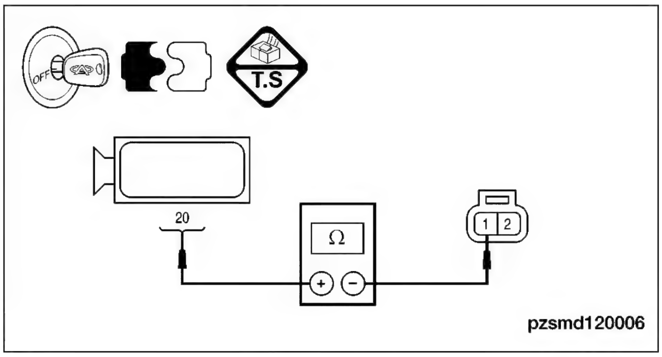
5. CHECK RIGHT FRONT WHEEL SPEED SENSOR GROUND CIRCUIT FOR AN OPEN

- Turn ignition switch off.
- Disconnect the ABS module electrical connector.
- Check the continuity between terminal 20 of the ABS module connector A-025, and terminal 1 of the Right Front wheel speed sensor connector A-020, terminal side.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open.



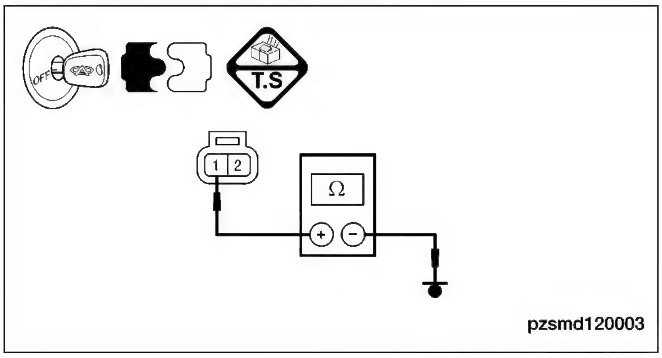
6. CHECK RIGHT FRONT WHEEL SPEED SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND

- Check the continuity between terminal 1 of the Right Front wheel speed sensor connector A-020, terminal side and ground.
- Continuity should not exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for a short to ground.



7. CHECK RIGHT FRONT WHEEL SPEED SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE

- Check the voltage between terminal 1 of the Right Front wheel speed sensor connector A-020, terminal side and ground.
- Voltage should not exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for a short to battery.

8. CHECK DTC

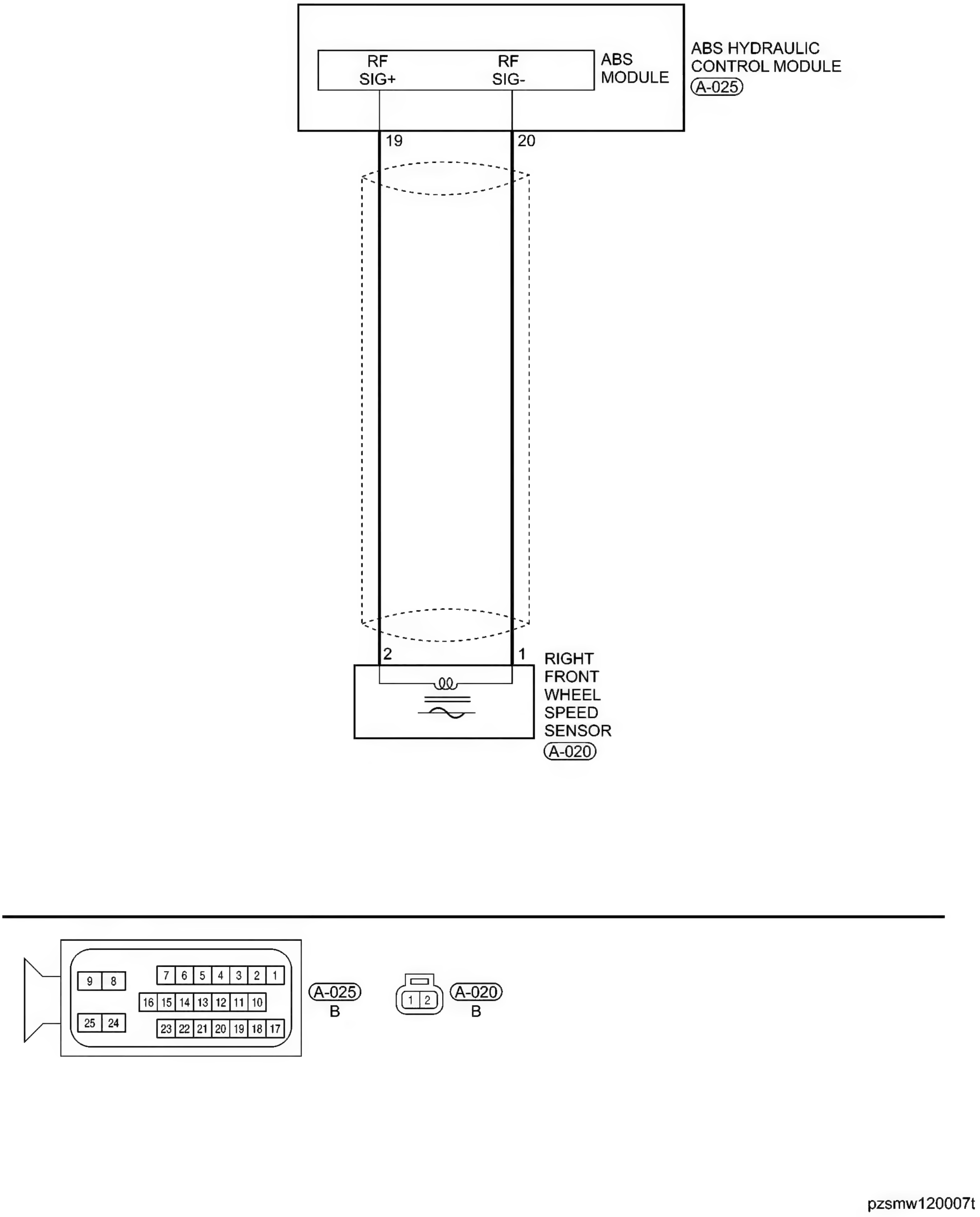
- With the X-431 scan tool, read the ABS module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC C1203 present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Erase all codes and test drive the vehicle to verify the repair is complete.

C1205 - Right Front Wheel Speed Sensor Gap Error


RF
SIG+
RF
SIG-
ABS
MODULE
ABS HYDRAULIC
CONTROL MODULE
A-025
19
20
2
1
RIGHT
FRONT
WHEEL
SPEED
SENSOR
A-020
9
8
25
24
7
6
5
4
3
2
1
16
15
14
13
12
11
10
23
22
21
20
19
18
17
A-025
B
1
2
A-020
B
pzsmw120007t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
C1205	Right front wheel speed sensor gap error	With the vehicle speed above 40 km/h (25 mph)	When the Right Front Wheel Speed Sensor input signal to the Antilock Brake System (ABS) module is excessive variation while vehicle speed is above 40 km/h (25 mph), or different wheel speed signal during acceleration, or sensed wheel speed is different from other wheels.	• Right Front wheel speed sensor • Bearing clearance • ABS module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Cycle the ignition switch from off to on.
- Start engine and warm it to normal operating temperature.
- Turn ignition switch off and wait for a few seconds.
- Start the engine. With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).

NOTE :
Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

NOTE :
If a DTC concerning a wheel speed sensor circuit being open or shorted is present, that DTC must be repaired before continuing.

- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).
- Erase all codes and test drive the vehicle to verify the repair is complete.
- This DTC must be active for the results of this test to be valid.

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground connection A-201 (See Ground Inspection in Section 12 Brakes).
- Inspect the ground connection A-201 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace the ground connection.

2. CHECK ABS MODULE DTC

- With the scan tool select: View ABS Data Stream.
- With an assistant driving the vehicle, check the following data stream list items while driving the vehicle over 40 km/h (25 mph).
  - Left Front Wheel Speed
  - Right Front Wheel Speed
  - Left Rear Wheel Speed
  - Right Rear Wheel Speed
- With the scan tool, read active DTCs in the ABS module.

Is DTC C1205 present and the Right Front Wheel Speed signal abnormal?

Yes >> Go to the next step.

No >> The condition that caused this DTC to set is currently not present (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).

3. CHECK AND ADJUST TIRE PRESSURE

- Turn ignition switch off.
- Check and adjust the tire pressure in the Right Front tire.
- Check and adjust all other tire pressures.
- Inspect for mismatched tires on the vehicle.

Is the Right Front tire improperly inflated or mismatched tires on the vehicle?

Yes >> Repair Right Front tire as necessary.

No >> Go to the next step.

4. CHECK CLEARANCE BETWEEN RIGHT FRONT WHEEL SPEED SENSOR AND SENSOR RING

- Inspect the wheel speed sensor and sensor ring for the following conditions that would result in an incorrect signal:
    - Damaged sensor
    - Loose sensor
    - Foreign material
- Check the clearance between Right Front wheel speed sensor and sensor ring.
- 1 - 2 mm should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Clean/replace the wheel speed sensor or sensor ring.
Reinstall the sensor and adjust the clearance as necessary.

5. CHECK RIGHT FRONT WHEEL BEARING FOR EXCESSIVE RUNOUT OR CLEARANCE

- Inspect the Right Front wheel bearing for excessive runout or clearance before replacing the wheel bearing assembly.
- Replace the Right Front wheel bearing assembly (See Front Hub and Bearing Removal & Installation in Section 09 Driveline & Axle).

WARNING!

To avoid personal injury or death, verify vehicle braking before road testing.

- Connect the module and sensor connectors.
- Road test the vehicle over 40 km/h (25 mph).

NOTE :
Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

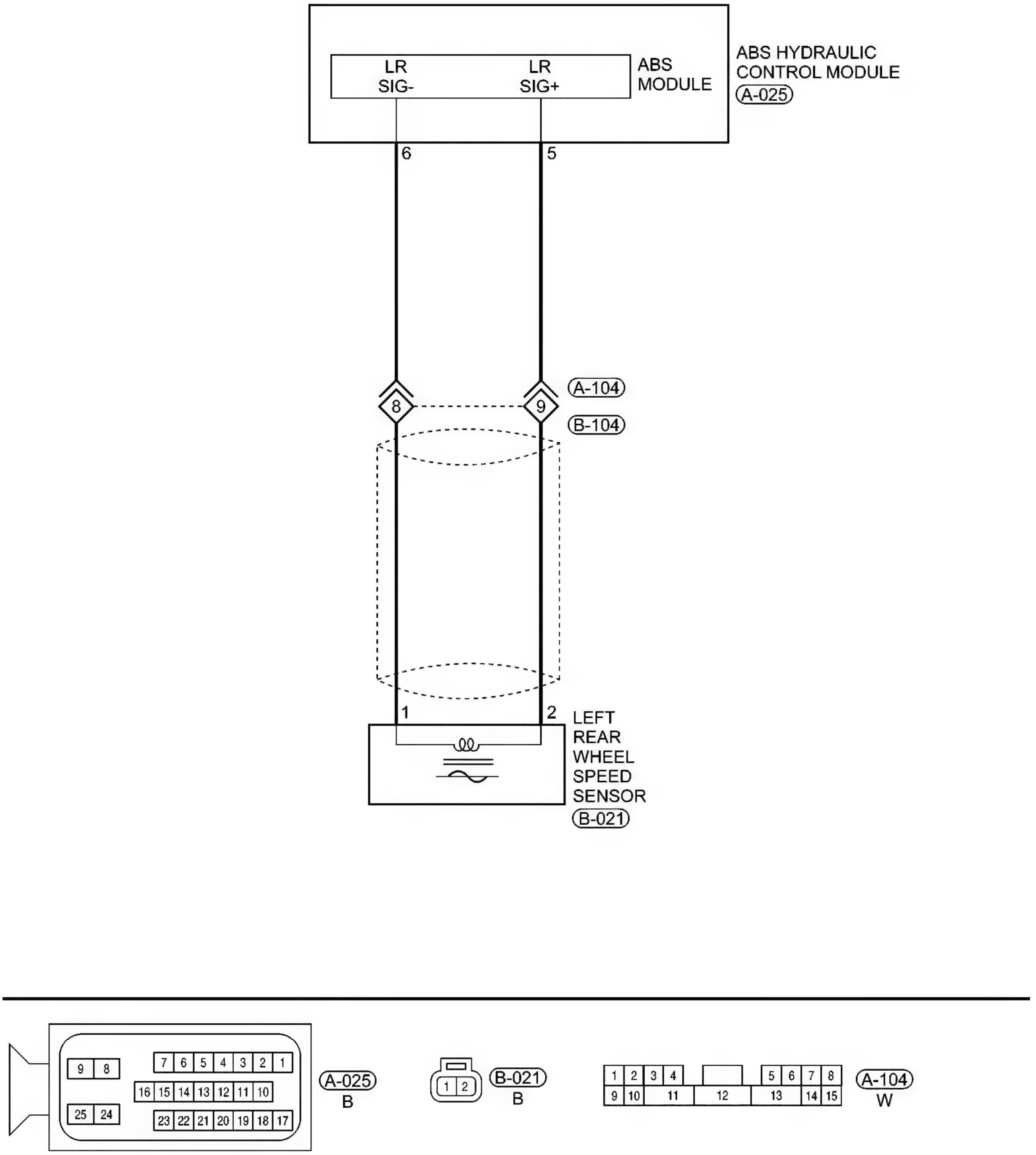
- With the X-431 scan tool, read ABS DTCs.

Is the DTC C1205 still present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

C1206 - Left Rear Wheel Speed Sensor Circuit Open or Shorted


LR SIG-
LR SIG+
ABS MODULE
ABS HYDRAULIC CONTROL MODULE
A-025
6
5
8
9
A-104
B-104
1
2
LEFT REAR WHEEL SPEED SENSOR
B-021
9 8 7 6 5 4 3 2 1
16 15 14 13 12 11 10
25 24 23 22 21 20 19 18 17
A-025
B
1 2
B-021
B
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15
A-104
W

pzsmw120008t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
C1206	Left rear wheel speed sensor circuit open or shorted	• Ignition switch: ON • Vehicle: Running	ABS module detected that the Left Rear wheel speed sensor input signal to ABS module is open or shorted.	• Left Rear wheel speed sensor • Harness is open or shorted • ABS module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Cycle the ignition switch from off to on.
- Start the engine and warm it to normal operating temperature.
- Turn ignition switch off and wait for a few seconds.
- Start the engine. With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).

NOTE :

Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).
- Erase all codes and test drive the vehicle to verify the repair is complete.

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK ABS MODULE DTC

- With the scan tool select: View ABS Data Stream.
- With an assistant driving the vehicle, check the following data stream list items while driving the vehicle over 40 km/h (25 mph).
  - Left Front Wheel Speed
  - Right Front Wheel Speed
  - Left Rear Wheel Speed
  - Right Rear Wheel Speed
- With the scan tool, read active DTCs in the ABS module.

Is DTC C1206 present and the Left Rear Wheel Speed signal abnormal?

Yes >> Go to the next step.

No >> The condition that caused this DTC to set is currently not present (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).

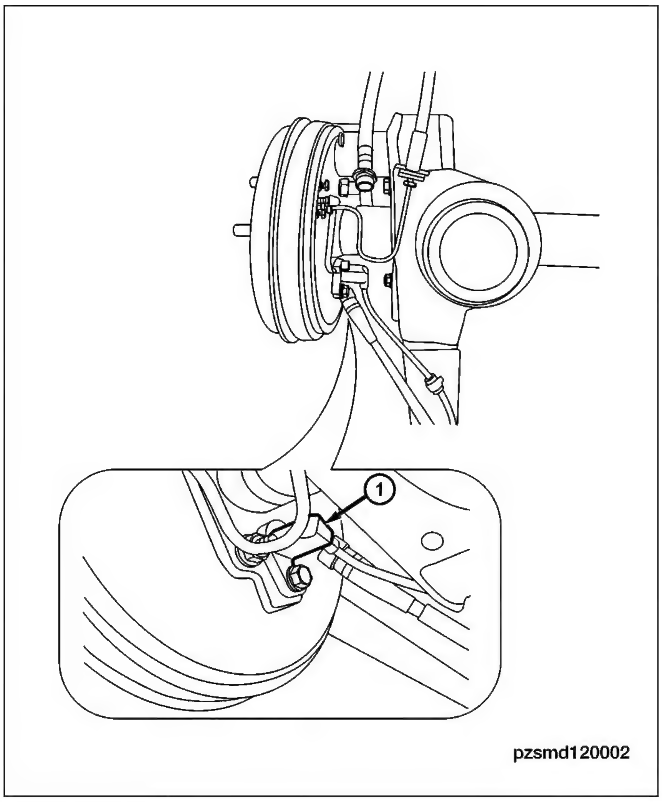
2. CHECK LEFT REAR WHEEL SPEED SENSOR ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the wheel speed sensor (1) electrical connector.
- Inspect the wheel speed sensor electrical connector.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



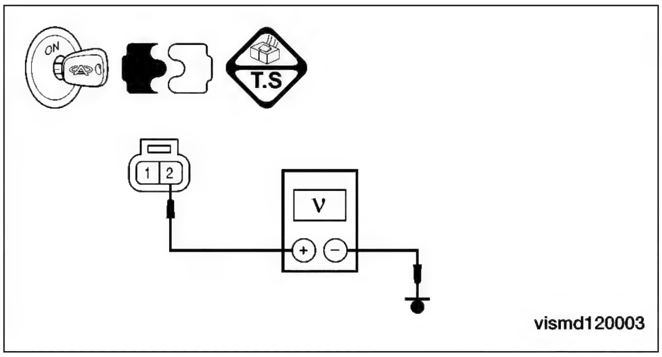
3. CHECK LEFT REAR WHEEL SPEED SENSOR REFERENCE SIGNAL CIRCUIT

- Turn ignition switch on.
- Measure the sensor reference voltage between terminal 2 of the wheel speed sensor connector B-021, terminal side and ground.
- Voltage should exist (less than 1.0 V).

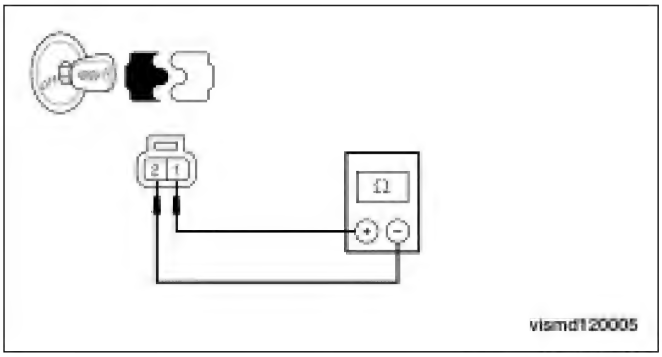
Is the proper voltage present?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to ground or short to battery in connector or harness.



4. CHECK LEFT REAR WHEEL SPEED SENSOR RESISTANCE



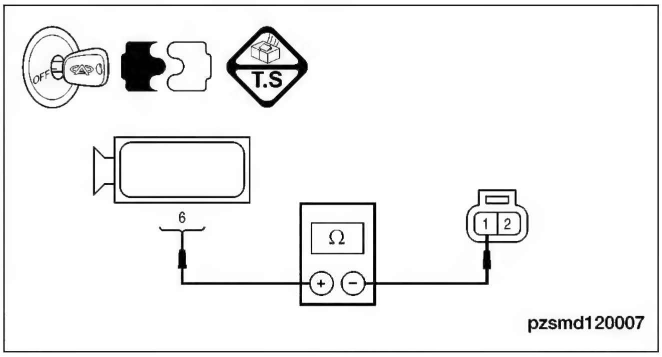
- Check the wheel speed sensor resistance between the sensor terminals 1 and 2, component side.

Is the sensor resistance 700 - 1500 ohms?

Yes >> Go to the next step.

No >> Replace the Left Rear wheel speed sensor.

5. CHECK LEFT REAR WHEEL SPEED SENSOR GROUND CIRCUIT FOR AN OPEN



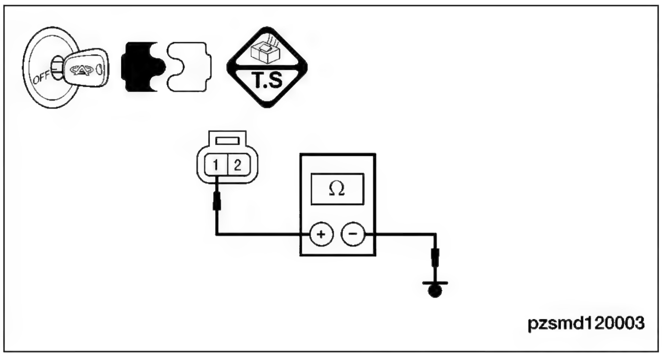
- Turn ignition switch off.
- Disconnect the ABS module electrical connector.
- Check the continuity between terminal 6 of the ABS module connector A-025, and terminal 1 of the Left Rear wheel speed sensor connector A-021, terminal side.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open.

6. CHECK LEFT REAR WHEEL SPEED SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND



- Check the continuity between terminal 1 of the Left Rear wheel speed sensor connector A-021, terminal side and ground.
- Continuity should not exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for a short to ground.

7. CHECK LEFT REAR WHEEL SPEED SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE

- Check the voltage between terminal 1 of the Left Rear wheel speed sensor connector A-021, terminal side and ground.
- Voltage should not exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for a short to battery.

8. CHECK DTC

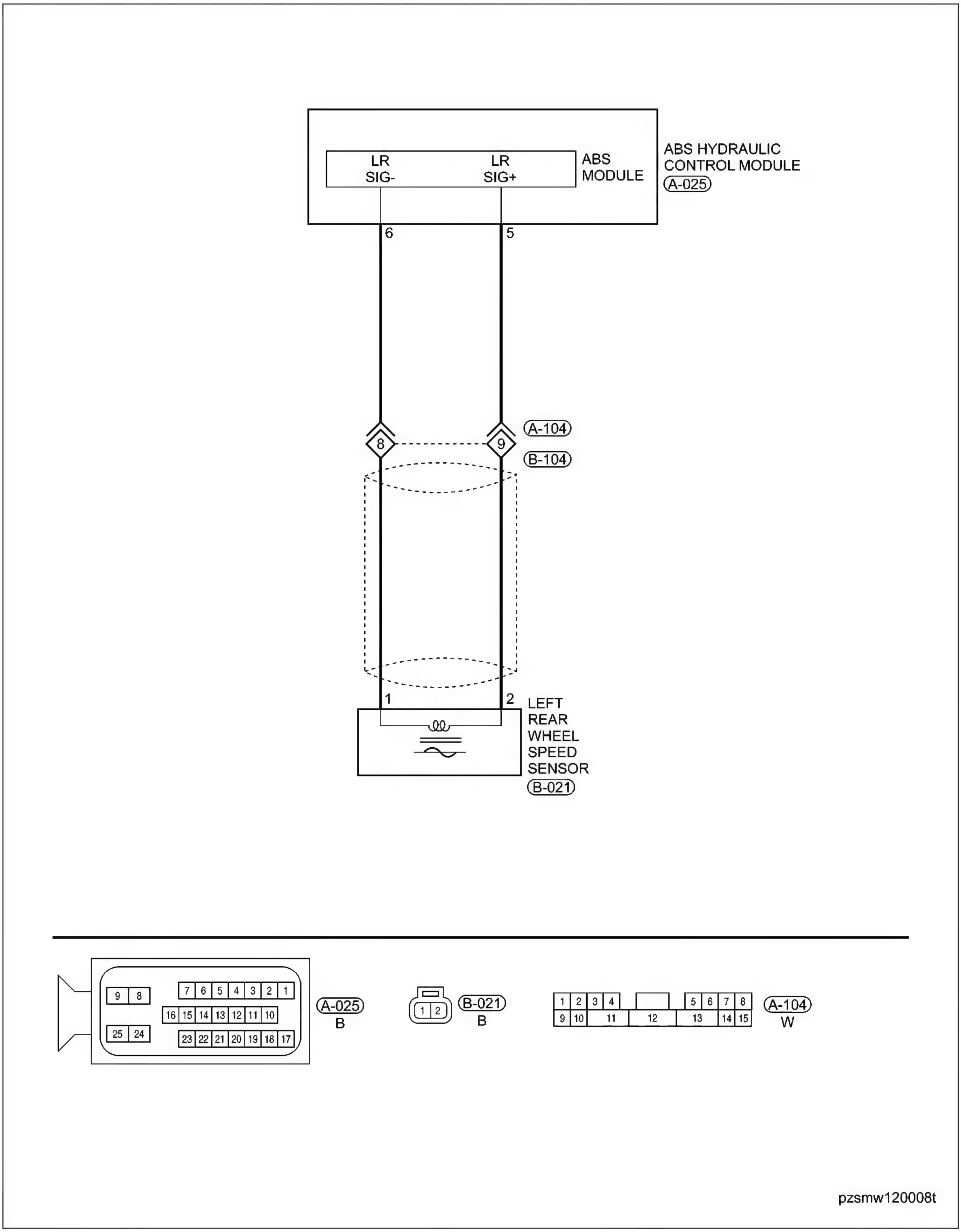
- With the X-431 scan tool, read the ABS module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC C1206 present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Erase all codes and test drive the vehicle to verify the repair is complete.

C1208 - Left Rear Wheel Speed Sensor Gap Error


LR SIG-
LR SIG+
ABS MODULE
ABS HYDRAULIC CONTROL MODULE
A-025
6
5
8
9
A-104
B-104
1
2
LEFT REAR WHEEL SPEED SENSOR
B-021
9 8 7 6 5 4 3 2 1
16 15 14 13 12 11 10
25 24 23 22 21 20 19 18 17
A-025
B
1 2
B-021
B
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15
A-104
W
pzsmw120008t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
C1208	Left rear wheel speed sensor gap error	With the vehicle speed above 40 km/h (25 mph)	When the Left Rear Wheel Speed Sensor input signal to the Antilock Brake System (ABS) module is excessive variation while vehicle speed is above 40 km/h (25 mph), or different wheel speed signal during acceleration, or sensed wheel speed is different from other wheels.	• Left Rear wheel speed sensor • Bearing clearance • ABS module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.
- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Cycle the ignition switch from off to on.
- Start engine and warm it to normal operating temperature.
- Turn ignition switch off and wait for a few seconds.
- Start the engine. With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).

NOTE :
Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

NOTE :
If a DTC concerning a wheel speed sensor circuit being open or shorted is present, that DTC must be repaired before continuing.
- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).
- Erase all codes and test drive the vehicle to verify the repair is complete.
- This DTC must be active for the results of this test to be valid.

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground connection A-201 (See Ground Inspection in Section 12 Brakes).
- Inspect the ground connection A-201 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace the ground connection.

2. CHECK ABS MODULE DTC

- With the scan tool select: View ABS Data Stream.
- With an assistant driving the vehicle, check the following data stream list items while driving the vehicle over 40 km/h (25 mph).
  - Left Front Wheel Speed
  - Right Front Wheel Speed
  - Left Rear Wheel Speed
  - Right Rear Wheel Speed
- With the scan tool, read active DTCs in the ABS module.

Is the DTC C1208 present and the Left Rear Wheel Speed signal normal?

Yes >> Go to the next step.

No >> See Diagnostic Help in Section 12 Brakes for more information on Intermittent DTC Troubleshooting.

3. CHECK AND ADJUST TIRE PRESSURE

- Turn ignition switch off.
- Check and adjust the tire pressure in the Left Rear tire.
- Check and adjust all other tire pressures.
- Inspect for mismatched tires on the vehicle.

Is the RL tire improperly inflated or mismatched tires on the vehicle?

Yes >> Repair Left Rear tire as necessary.

No >> Go to the next step.

4. CHECK CLEARANCE BETWEEN LEFT REAR WHEEL SPEED SENSOR AND SENSOR RING

- Inspect the wheel speed sensor and sensor ring for the following conditions that would result in an incorrect signal:
  - Damaged sensor
  - Loose sensor
  - Foreign material
- Check the clearance between Left Rear wheel speed sensor and sensor ring.
- 1 - 2 mm should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Clean/replace the wheel speed sensor or sensor ring.
Reinstall the sensor and adjust the clearance as necessary.

5. CHECK RL WHEEL BEARING FOR EXCESSIVE RUNOUT OR CLEARANCE

- Inspect the Left Rear wheel bearing for excessive runout or clearance before replacing the wheel bearing assembly.
- Replace the Left Rear wheel bearing assembly (See Front Hub and Bearing Removal & Installation in Section 09 Driveline & Axle).

WARNING!

To avoid personal injury or death, verify vehicle braking before road testing.

- Connect the module and sensor connectors.
- Road test the vehicle over 40 km/h (25 mph).

NOTE :
Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

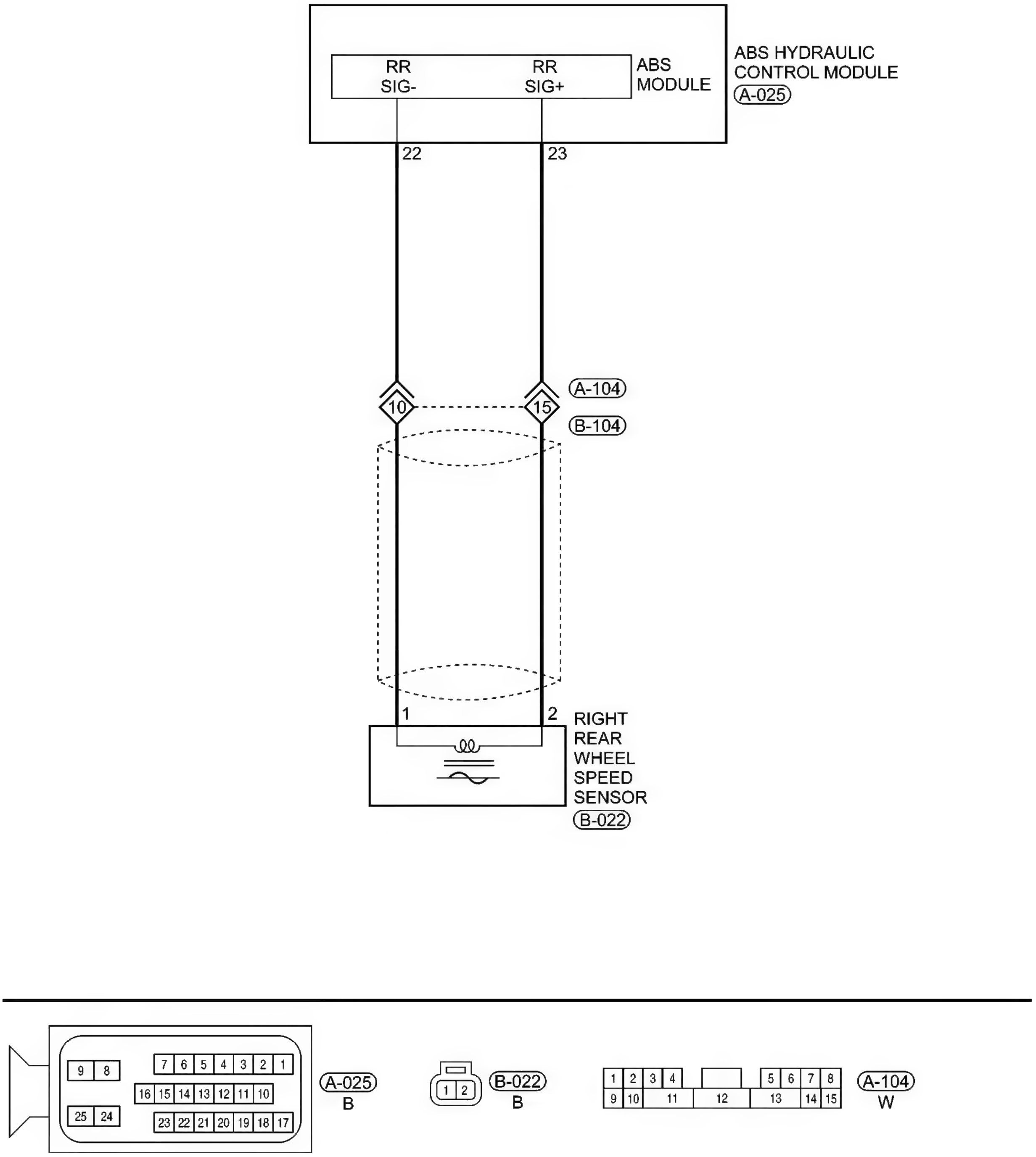
- With the X-431 scan tool, read ABS DTCs.

Is the DTC C1208 still present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

C1209 - Right Rear Wheel Speed Sensor Circuit Open or Shorted


ABS HYDRAULIC CONTROL MODULE
A-025
ABS MODULE
RR SIG-
RR SIG+
22
23
A-104
B-104
10
15
1
2
RIGHT REAR WHEEL SPEED SENSOR
B-022
A-025
B
B-022
B
A-104
W

pzsmw120009t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
C1209	Right rear wheel speed sensor circuit open or shorted	• Ignition switch: ON • Vehicle: Running	ABS module detected that the Right Rear wheel speed sensor input signal to ABS module is open or shorted.	• Right Rear wheel speed sensor • Harness is open or shorted • ABS module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Cycle the ignition switch from off to on.
- Start the engine and warm it to normal operating temperature.
- Turn ignition switch off and wait for a few seconds.
- Start the engine. With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).

NOTE :

Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).
- Erase all codes and test drive the vehicle to verify the repair is complete.

NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK ABS MODULE DTC

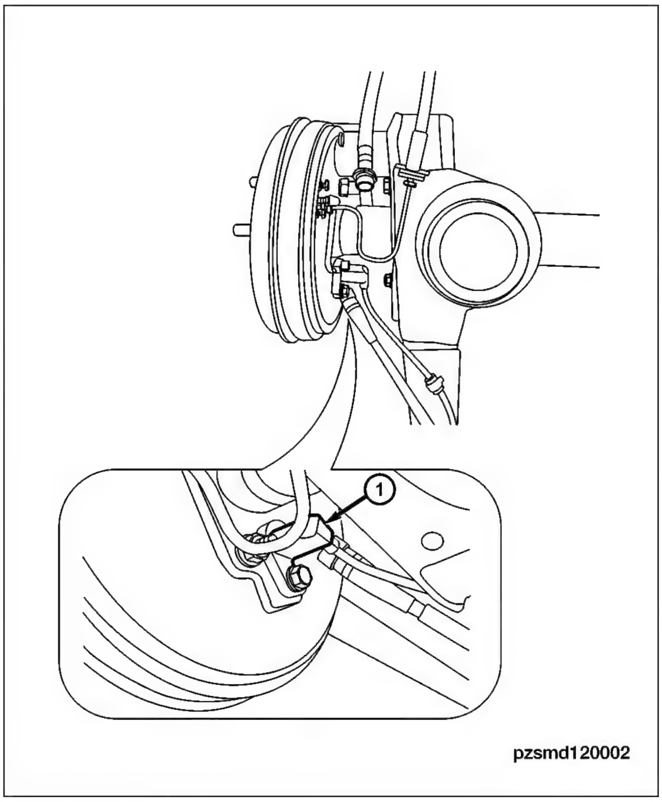
- With the scan tool select: View ABS Data Stream.
- With an assistant driving the vehicle, check the following data stream list items while driving the vehicle over 40 km/h (25 mph).
  - Left Front Wheel Speed
  - Right Front Wheel Speed
  - Left Rear Wheel Speed
  - Right Rear Wheel Speed
- With the scan tool, read active DTCs in the ABS module.

Is DTC C1209 present and the Right Rear Wheel Speed signal abnormal?

Yes >> Go to the next step.

No >> The condition that caused this DTC to set is currently not present (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).

2. CHECK RIGHT REAR WHEEL SPEED SENSOR ELECTRICAL CONNECTOR



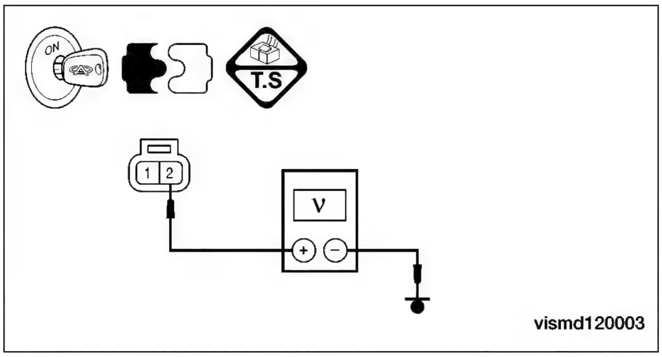
- Turn ignition switch off.
- Disconnect the wheel speed sensor (1) electrical connector.
- Inspect the wheel speed sensor electrical connector.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

3. CHECK RIGHT REAR WHEEL SPEED SENSOR REFERENCE SIGNAL CIRCUIT



- Turn ignition switch on.
- Measure the sensor reference voltage between terminal 2 of the wheel speed sensor connector B-022, terminal side and ground.
- Voltage should exist (less than 1.0 V).

Is the proper voltage present?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open, short to ground or short to battery in connector or harness.

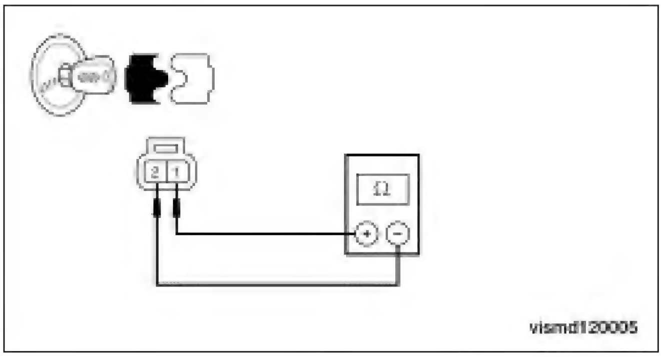
4. CHECK RIGHT REAR WHEEL SPEED SENSOR RESISTANCE

- Check the wheel speed sensor resistance between the sensor terminals 1 and 2, component side.

Is the sensor resistance 700 - 1500 ohms?

Yes >> Go to the next step.

No >> Replace the Right Rear wheel speed sensor.



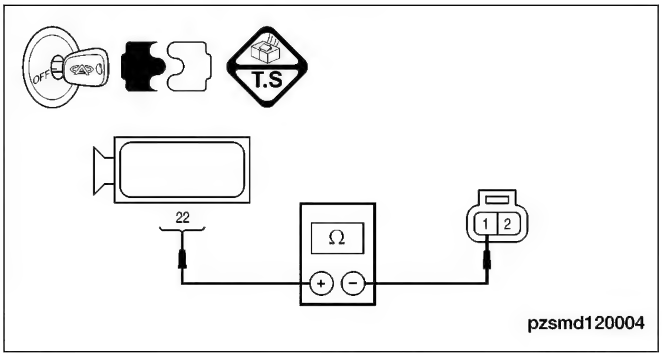
5. CHECK RIGHT REAR WHEEL SPEED SENSOR GROUND CIRCUIT FOR AN OPEN

- Turn ignition switch off.
- Disconnect the ABS module electrical connector.
- Check the continuity between terminal 22 of the ABS module connector A-025, and terminal 1 of the Right Rear wheel speed sensor connector A-022, terminal side.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open.



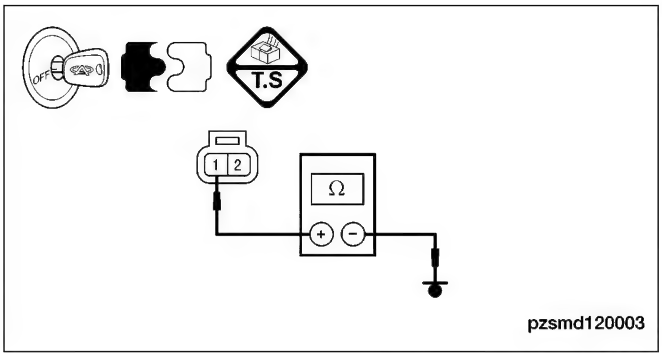
6. CHECK RIGHT REAR WHEEL SPEED SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND

- Check the continuity between terminal 1 of the Right Rear wheel speed sensor connector A-022, terminal side and ground.
- Continuity should not exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for a short to ground.



7. CHECK RIGHT REAR WHEEL SPEED SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE

- Check the voltage between terminal 1 of the Right Rear wheel speed sensor connector A-022, terminal side and ground.
- Voltage should not exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for a short to battery.

8. CHECK DTC

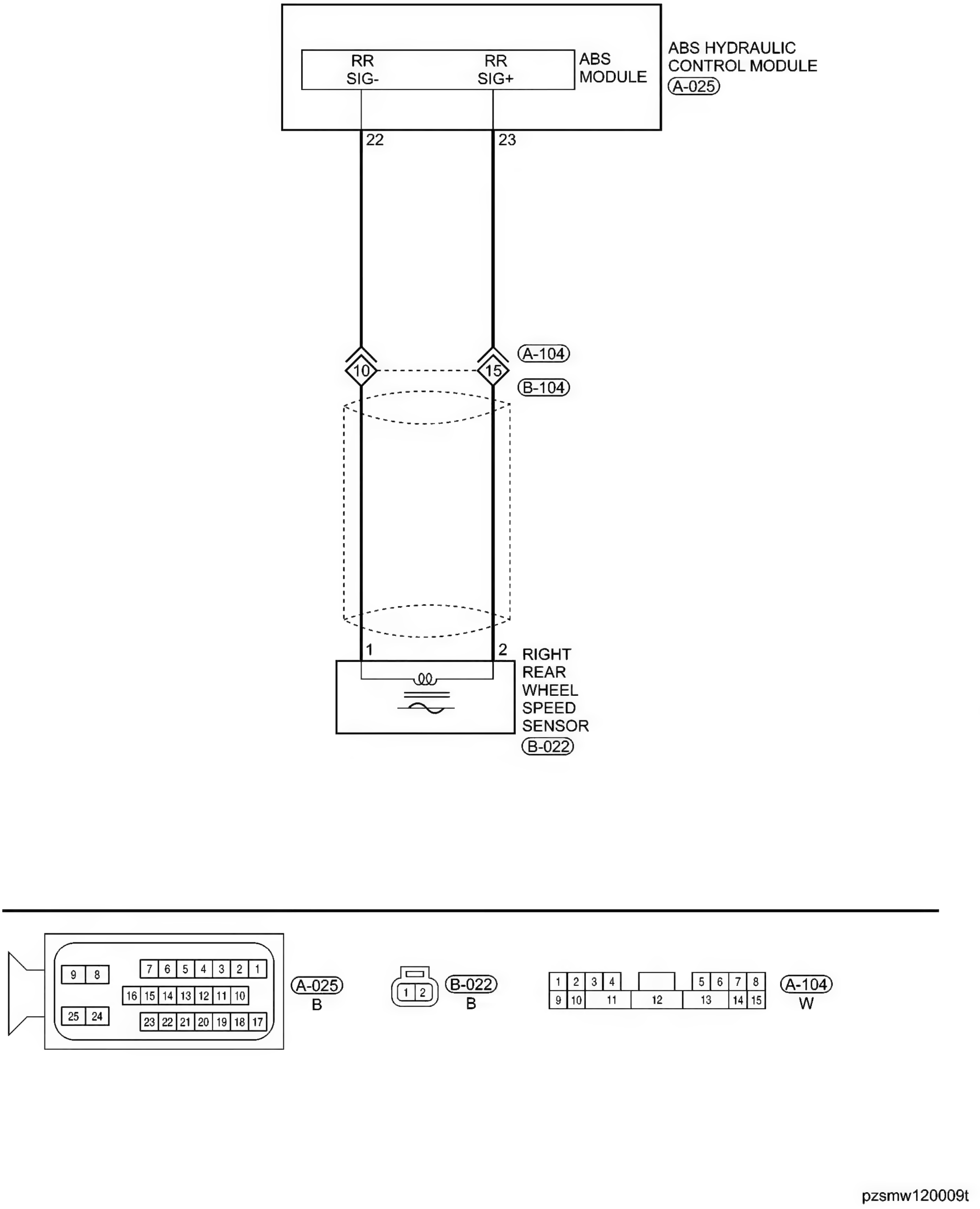
- With the X-431 scan tool, read the ABS module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC C1209 present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Erase all codes and test drive the vehicle to verify the repair is complete.

C1211 - Right Rear Wheel Speed Sensor Gap Error


RR SIG-
RR SIG+
ABS MODULE
ABS HYDRAULIC CONTROL MODULE
A-025
22
23
A-104
10
15
B-104
1
2
RIGHT REAR WHEEL SPEED SENSOR
B-022
9 8 7 6 5 4 3 2 1
16 15 14 13 12 11 10
25 24 23 22 21 20 19 18 17
A-025
B
1 2
B-022
B
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15
A-104
W
pzsmw120009t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
C1211	Right rear wheel speed sensor gap error	With the vehicle speed above 40 km/h (25 mph)	When the Right Rear Wheel Speed Sensor input signal to the Antilock Brake System (ABS) module is excessive variation while vehicle speed is above 40 km/h (25 mph), or different wheel speed signal during acceleration, or sensed wheel speed is different from other wheels.	• Right Rear wheel speed sensor • Bearing clearance • ABS module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Cycle the ignition switch from off to on.
- Start engine and warm it to normal operating temperature.
- Turn ignition switch off and wait for a few seconds.
- Start the engine. With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).

NOTE :
Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

NOTE :
If a DTC concerning a wheel speed sensor circuit being open or shorted is present, that DTC must be repaired before continuing.

- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).
- Erase all codes and test drive the vehicle to verify the repair is complete.
- This DTC must be active for the results of this test to be valid.

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground connection A-201 (See Ground Inspection in Section 12 Brakes).
- Inspect the ground connection A-201 mounting position (See Vehicle Wiring Harness Layout - Engine Room Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace the ground connection.

2. CHECK ABS MODULE DTC

- With the scan tool select: View ABS Data Stream.
- With an assistant driving the vehicle, check the following data stream list items while driving the vehicle over 40 km/h (25 mph).
  - Left Front Wheel Speed
  - Right Front Wheel Speed
  - Left Rear Wheel Speed
  - Right Rear Wheel Speed
- With the scan tool, read active DTCs in the ABS module.

Is DTC C1211 present and the Right Rear Wheel Speed signal abnormal?

Yes >> Go to the next step.

No >> The condition that caused this DTC to set is currently not present (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).

3. CHECK AND ADJUST TIRE PRESSURE

- Turn ignition switch off.
- Check and adjust the tire pressure in the Right Rear tire.
- Check and adjust all other tire pressures.
- Inspect for mismatched tires on the vehicle.

Is the Right Rear tire improperly inflated or mismatched tires on the vehicle?

Yes >> Repair Right Rear tire as necessary.

No >> Go to the next step.

4. CHECK CLEARANCE BETWEEN RIGHT REAR WHEEL SPEED SENSOR AND SENSOR RING

- Inspect the wheel speed sensor and sensor ring for the following conditions that would result in an incorrect signal:
  - Damaged sensor
  - Loose sensor
  - Foreign material
- Check the clearance between Right Rear wheel speed sensor and sensor ring.
- 1 - 2 mm should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Clean/replace the wheel speed sensor or sensor ring.
Reinstall the sensor and adjust the clearance as necessary.

5. CHECK RIGHT REAR WHEEL BEARING FOR EXCESSIVE RUNOUT OR CLEARANCE

- Inspect the Right Rear wheel bearing for excessive runout or clearance before replacing the wheel bearing assembly.
- Replace the Right Rear wheel bearing assembly (See Rear Hub and Bearing Removal & Installation in Section 09 Driveline & Axle).

WARNING!

To avoid personal injury or death, verify vehicle braking before road testing.

- Connect the module and sensor connectors.
- Road test the vehicle over 40 km/h (25 mph).

NOTE :
Vehicle must be driven above 40 km/h (25 mph) for fault setting conditions to be met.

- With the X-431 scan tool, read ABS DTCs.

Is DTC C1211 still present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

C1604 - ECU Defect, Internal Errors or Solenoid Fault

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
C1604	ECU defect, internal errors or solenoid fault	ABS module detected an internal failure or solenoid failure.	ABS module or solenoid

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the ABS module.
- Cycle the ignition switch.
- Start engine and warm it to normal operating temperature.
- Turn ignition switch off and wait for a few seconds.
- Start the engine. With the scan tool connected to the DLC, drive the vehicle over 40 km/h (25 mph).
- With the scan tool select: View ABS Data Stream and DTC.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).
- Erase all codes and test drive the vehicle to verify the repair is complete.

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK DTC

- Perform DTC confirmation procedure.

Is DTC C1604 present?

Yes >> Go to the next step.

No >> The condition that caused this DTC to set is currently not present (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 12 Brakes for more information).

2. CHECK ABS MODULE POWER SUPPLY AND GROUND CIRCUIT

- Check the ABS module voltage supply circuit and ground circuit for an open, high resistance or short circuit.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair circuit for an open or short in harness and connectors.

3. CHECK DTC

- With the X-431 scan tool, read ABS module DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC C1604 still present?

Yes >> Replace the ABS module (See ABS Module Removal & Installation in Section 12 Brakes).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

ON-VEHICLE SERVICE

Antilock Brake System (ABS) Bleeding Procedure

ABS Bleeding Information

WARNING!

When bleeding the brake system, wear safety glasses. A clear bleed tube must be attached to the bleeder screws and submerged in a clear container filled partially with clean brake fluid. Direct the flow of brake fluid away from yourself and the painted surfaces of the vehicle. Brake fluid at high pressure may come out of the bleeder screws when opened.

CAUTION:

Before removing the master cylinder cap, wipe it clean to prevent dirt and other foreign matter from dropping into the master cylinder reservoir. Use brake fluid or an equivalent from a fresh, tightly sealed container. Brake fluid must conform to DOT 4 specifications.

NOTE :

During the brake bleeding procedure, be sure the brake fluid level remains close to the ″MAX″ level in the master cylinder fluid reservoir. Check the fluid level periodically during the bleeding procedure and add brake fluid as required.

NOTE :

Do not pump the brake pedal at any time while having a bleeder screw open during the bleeding process. This will only increase the amount of air in the system and make additional bleeding necessary. Do not allow the master cylinder reservoir to run out of brake fluid while bleeding the system. An empty reservoir will allow additional air into the brake system. Check the fluid level frequently and add fluid as needed. The following wheel circuit sequence for bleeding the brake hydraulic system should be used to ensure adequate removal of all trapped air from the hydraulic system.

ABS Bleeding Instructions

When bleeding the ABS system, the following bleeding sequence must be followed to ensure complete and adequate bleeding:

1. Make sure all hydraulic fluid lines are installed and properly torqued.
2. Connect the X-431 scan tool to the diagnostics connector.
3. Using the scan tool, check to make sure the ABS module does not have any fault codes stored. If it does, clear them.
4. Bleed the base brake system (See Manuel Brake Bleeding in Section 12 Brake).

NOTE :

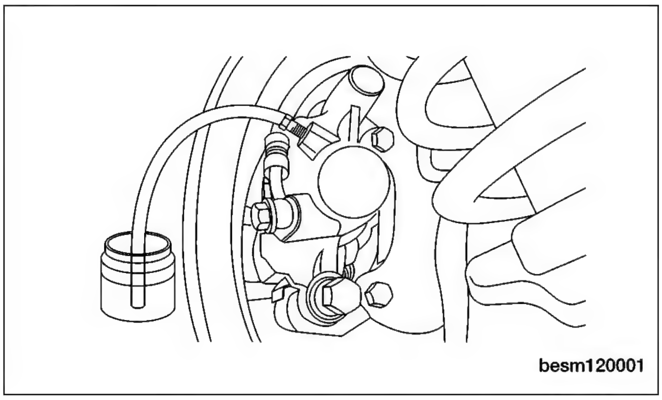
Pressure bleeding is recommended to bleed the base brake system to ensure all air is removed from the brake system.

5. Using the scan tool, access ABS bleeding. Follow the instructions displayed. When finished, disconnect the scan tool and proceed.
6. Bleed the base brake system a second time. Check brake fluid level in the reservoir periodically to prevent emptying, causing air to enter the hydraulic system.
7. Fill the master cylinder fluid reservoir to the ″MAX″ level.
8. Test drive the vehicle to be sure the brakes are operating correctly and that the brake pedal does not feel spongy.

Manual Bleeding Instructions

NOTE :
To bleed the brakes manually, the aid of a helper will be required.

Attach a clear plastic hose to the bleeder screw and feed the hose into a clear jar containing enough fresh brake fluid to submerge the end of the hose.


besm120001

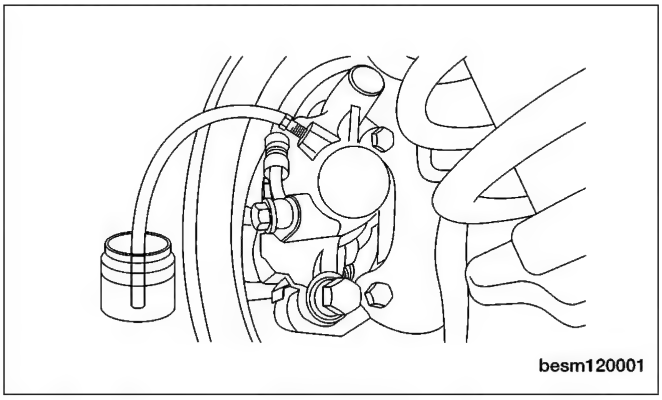
1. Turn the ignition switch off.
2. Have a helper pump the brake pedal three or four times and hold it in the down position.
3. With the pedal in the down position, open the bleeder screw at least one full turn.
4. Once the brake pedal has dropped, close the bleeder screw. After the bleeder screw is closed, release the brake pedal.
5. Repeat the above steps until all trapped air is removed from that wheel circuit (usually four or five times).
6. Bleed the remaining wheel circuits in the same manner until all air is removed from the brake system. Monitor the fluid level in the master cylinder reservoir to make sure it does not go dry.
7. Check and adjust brake fluid level to the ″MAX″ mark.
8. Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Re-bleed the brakes as necessary.
9. Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.

Pressure Bleeding Instructions

NOTE :
Follow pressure bleeder manufacturer’s instructions for use of pressure bleeding equipment.

Attach the pressure bleeding equipment to the Master Cylinder.

Attach a clear plastic hose to the bleeder screw and feed the hose into a clear jar containing enough fresh brake fluid to submerge the end of the hose.


besm120001

1. Open the bleeder screw at least one full turn or more to obtain a steady stream of brake fluid.
2. After approximately 120-240 ml of fluid have been bled through the brake circuit and an air-free flow is maintained in the clear plastic hose and jar, close the bleeder screw.
3. Repeat this procedure at all the remaining bleeder screws.
4. Check and adjust brake fluid level to the ″MAX″ mark on the reservoir.
5. Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Re-bleed the brakes as necessary.
6. Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.

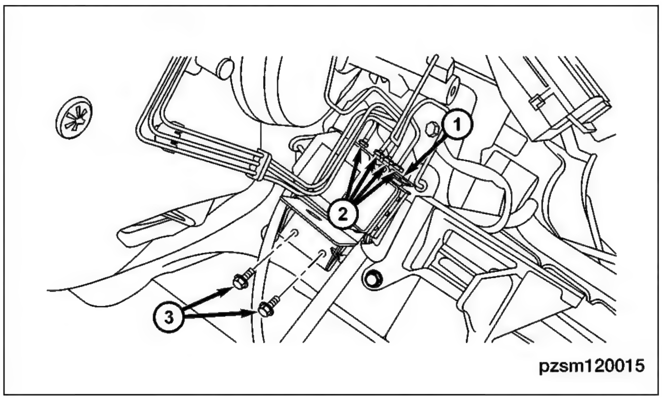
Antilock Brake System (ABS) Hydraulic Control Module

Removal & Installation

NOTE :
The following special tools are required to perform the repair procedure:
- Diagnostic Scan Tool X-431

NOTE :
The ABS hydraulic control module is comprised of the Hydraulic Control Unit (HCU) and the Electronic Control Unit (ECU). These are serviced as a complete unit and cannot be serviced separately.

1. Disconnect the negative battery cable.
2. Turn the ignition switch off.
3. Using a brake pedal holding tool, depress the brake pedal past its first 25 mm of travel and hold it in this position. This will isolate the master cylinder from the brake hydraulic system and will not allow the brake fluid to drain out of the master cylinder reservoir while the lines are disconnected.
4. Remove the brake tubes (2) at the hydraulic control unit.
   (Tighten: Brake tube nuts to 10 N·m)
5. Disconnect the ABS module electrical connector (1).
6. Remove the mounting bolts (3) attaching the HCU mounting bracket to vehicle.
   (Tighten: ABS mounting bracket bolts to 20 N·m)



7. Position the brake tubes as necessary without bending them.
8. Remove the ABS HCU from vehicle.
9. Remove the ABS mounting bolts and mounting bracket as necessary.
   (Tighten: ABS mounting bolts to 10 N·m)
10. Installation is in the reverse order of removal.

Installation Notes:

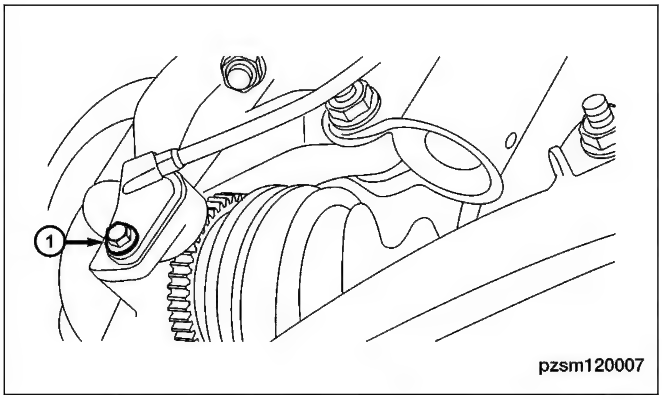
- After installation connect the X-431 scan tool to initialize the ABS module and bleed the brake system (See Antilock Brake System (ABS) Bleeding Procedure in Section 12 Brakes).

Front Wheel Speed Sensor

Removal & Installation

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove the wheel mounting nuts and the tire and wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)

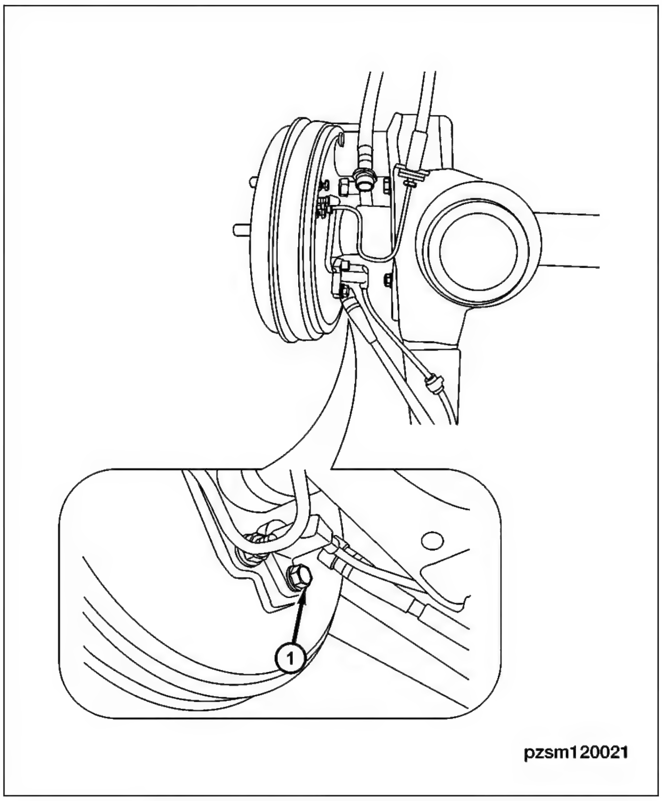
4. Remove the front wheel speed sensor retaining bolt (1).
   (Tighten: Front wheel speed sensor retaining bolt to 10 N·m)
5. Remove the front wheel speed sensor.
6. Installation is in the reverse order of removal.

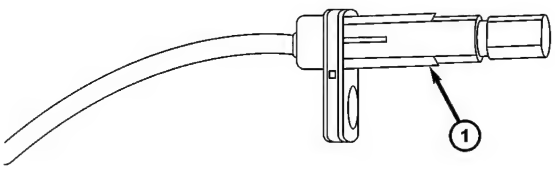


Rear Wheel Speed Sensor

Removal & Installation

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove the wheel mounting nuts and the tire and wheel assembly.
   (Tighten: Wheel mounting nuts to 110 N·m)
4. Remove the rear wheel speed sensor mounting bolt (1).
   (Tighten: Rear wheel speed sensor mounting bolts to 10 N·m)





5. Remove the rear wheel speed sensor (1).
6. Installation is in the reverse order of removal.

PARKING BRAKE

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Removal & Installation 12-85

Parking Brake Cable 12-85
Removal & Installation 12-85

GENERAL INFORMATION

Description

The parking brakes consist of the following components:

- Hand-operated parking brake lever
- Parking brake cables (one each side)
- Parking brake controls

Operation

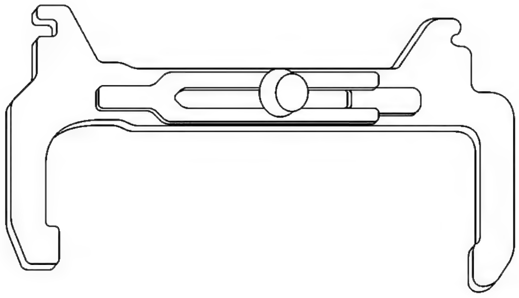
All vehicles are equipped with a center-mounted, hand-operated parking brake lever mounted between the front seats. A tensioner is built into the equalizer mounted on the end of the lever's output cable. There is an individual parking brake cable for each rear wheel that joins a parking brake cable equalizer, attached to the parking brake lever, to the rear parking brakes. The parking brake cables are made of flexible steel cable.

Specifications

Torque Specifications

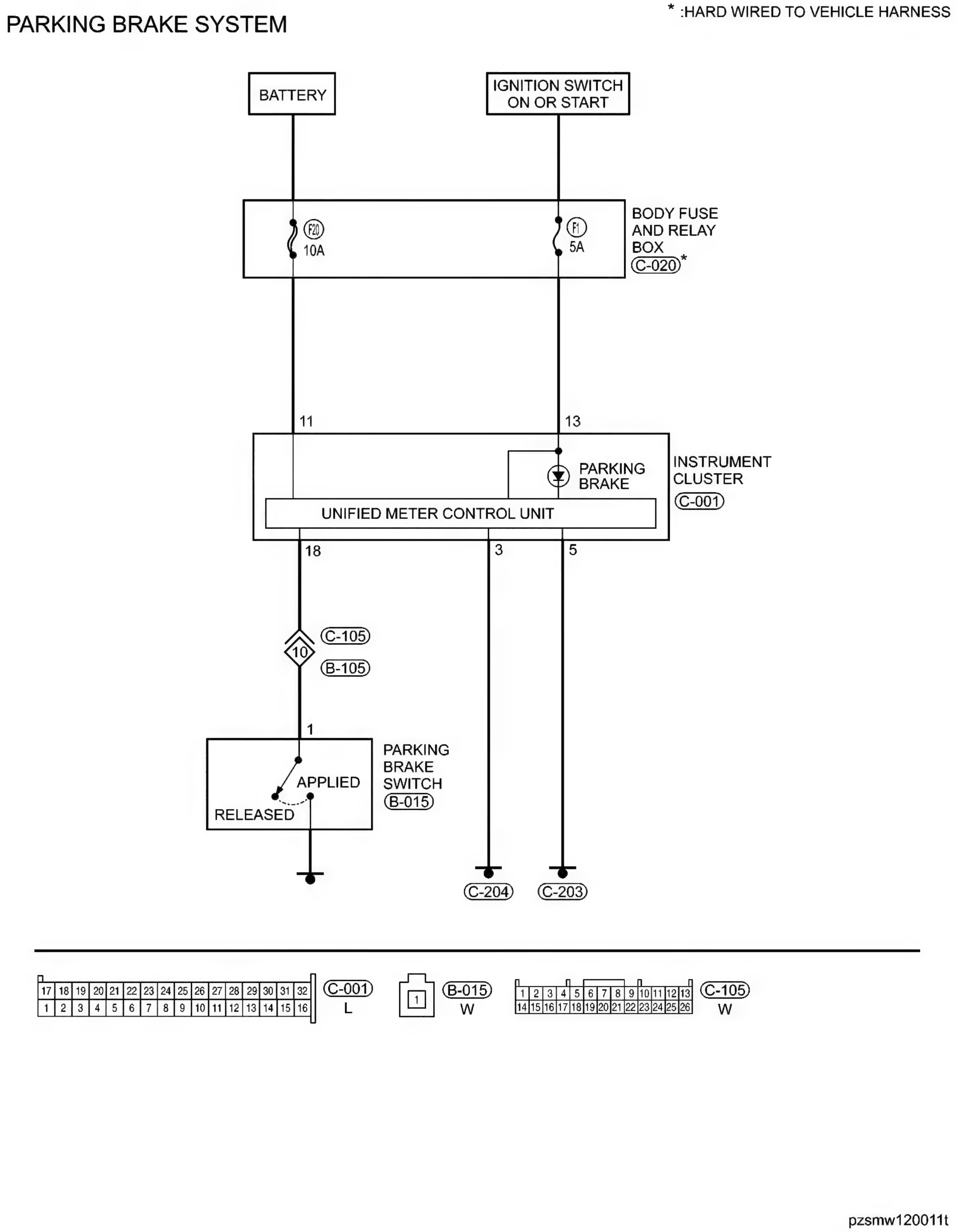
DESCRIPTION	TORQUE (N·m)
Parking Brake Cable Bracket Bolts	9 - 12
Wheel Mounting Nuts	110

Special Tools

Brake Measuring Gauge	 besm120025

Electrical Schematics

Parking Brake System (Page 1 of 1)


PARKING BRAKE SYSTEM
* :HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
F20
10A
F1
5A
BODY FUSE AND RELAY BOX
C-020*
11
13
PARKING BRAKE
INSTRUMENT CLUSTER
C-001
UNIFIED METER CONTROL UNIT
18
3
5
C-105
10
B-105
1
APPLIED
RELEASED
PARKING BRAKE SWITCH
B-015
C-204
C-203
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-001
L
1
B-015
W
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
C-105
W
pzsmw120011t

DIAGNOSIS & TESTING

Parking Brake Warning Light

The parking brake switch is part of the circuit for the red warning lamp in the dash panel. The switch will cause the lamp to illuminate only when the parking brakes are applied. If the lamp remains on after the parking brake is released, the switch or circuit is faulty.

Parking Brake Operation

The leading cause of improper parking brake operation, is excessive clearance between the parking brake shoes and the shoe braking surface. Excessive clearance is a result of lining and/or drum wear, drum surface machined oversize.

In most cases, the actual cause of an improperly functioning parking brake (too loose/too tight/won't hold), can be traced to a parking brake component.

Inspect the following when diagnosing a parking brake problem:

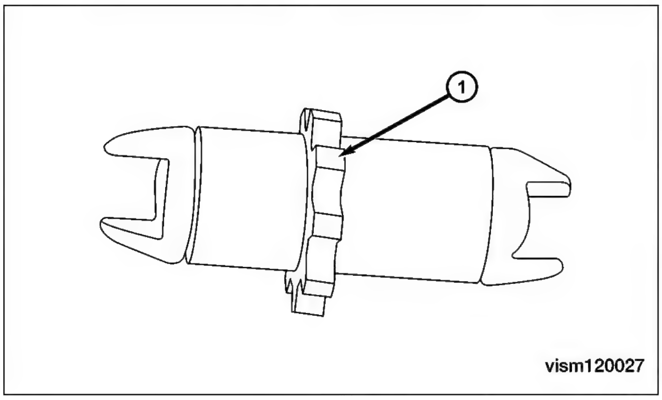
- Brake shoe wear
- Drum surface (in rear rotor) machined oversize
- Front cable not secured to lever
- Rear cable not attached to actuator
- Rear cable seized
- Parking brake lever not seated
- Parking brake lever bind

Parking Brake Adjustment

Adjust the parking brake only if the parking brake lever can be pulled up more than 3 notches without having an adequate solid braking effect.

NOTE :
Excessive parking brake lever travel (sometimes described as a loose lever or too loose condition) could be the result of worn brake shoes, improper brake shoe adjustment, or improperly assembled brake parts. A too-loose condition can also be caused by inoperative or improperly assembled parking brake components. Always confirm that the parking brake components are assembled properly. Perform the following procedure to adjust the parking brake:

1. Verify the parking brake lever is in the released (down) position.
2. Raise and support the vehicle.
3. Remove the wheel mounting nuts and the rear tire and wheel assemblies.
4. Remove the rear brake drum.
5. Adjust the parking brake shoes by turning the adjuster (1).



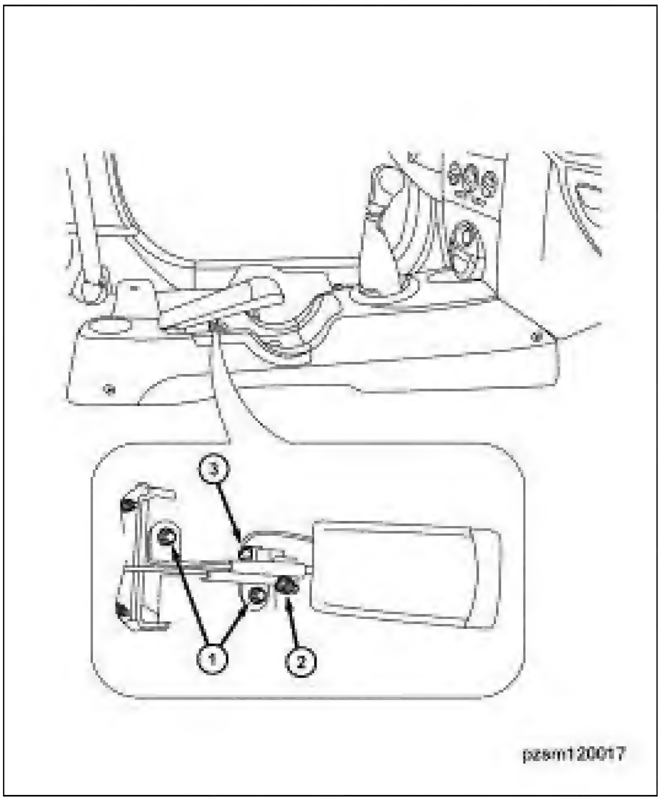
6. Reach inside the vehicle and fully apply and release the parking brake.
7. With the parking brake lever in the fully applied (up) position, attempt to rotate the rear rotors by hand (to ensure that the parking brake shoes are working properly).
8. With the parking brake lever in the released (down) position, attempt to rotate the rear rotors by hand (to ensure that the parking brake shoes are not dragging).
9. Install both rear tire and wheel assemblies and the wheel mounting nuts.
   (Tighten: Wheel mounting nuts to 110 N·m)
10. Lower the vehicle.

ON-VEHICLE SERVICE

Parking Brake Lever

Removal & Installation

1. Disconnect the negative battery cable.
2. Block the tire and wheel assemblies so the vehicle does not move once the vehicle parking brake lever is released.
3. Remove the center console (See Center Console Removal & Installation in Section 15 Body & Accessories).
4. Release and lower the parking brake lever.
5. Loosen the adjusting nut (2) on the lever's output cable, taking tension off parking brake cables.
6. Back the nut off until it is flush with the end of the output cable.
7. Remove the parking brake cables from the parking brake cable equalizer.
8. Disconnect the electrical connector (3) from the parking brake switch.
9. Remove the bolts (1) attaching the parking brake lever to the vehicle.
   (Tighten: Parking brake lever nuts to 30 N·m)



10. Remove the parking brake assembly.
11. Installation is in the reverse order of removal.

Installation Notes:

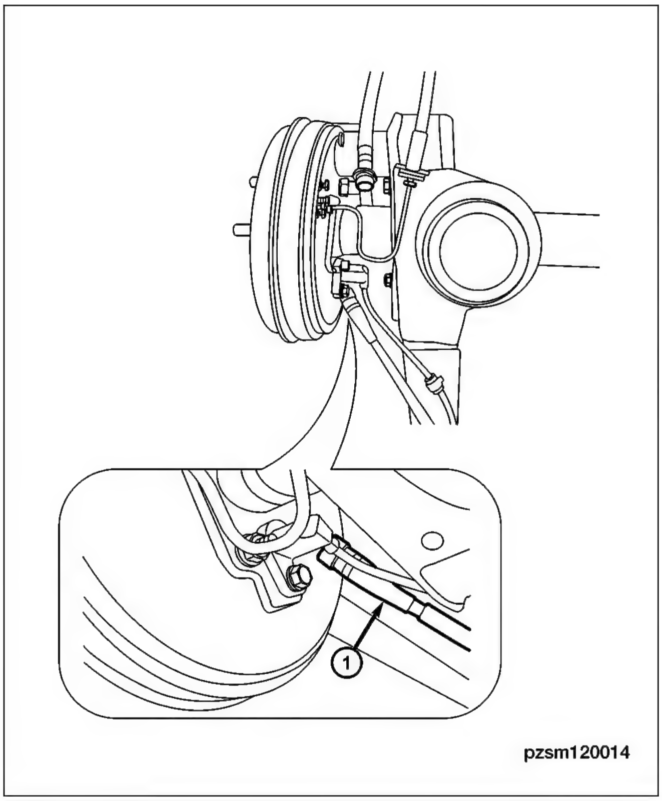
- After installation, adjust the parking brake cable as necessary (See Parking Brake Adjustment in Section 12 Brakes).

Parking Brake Cable

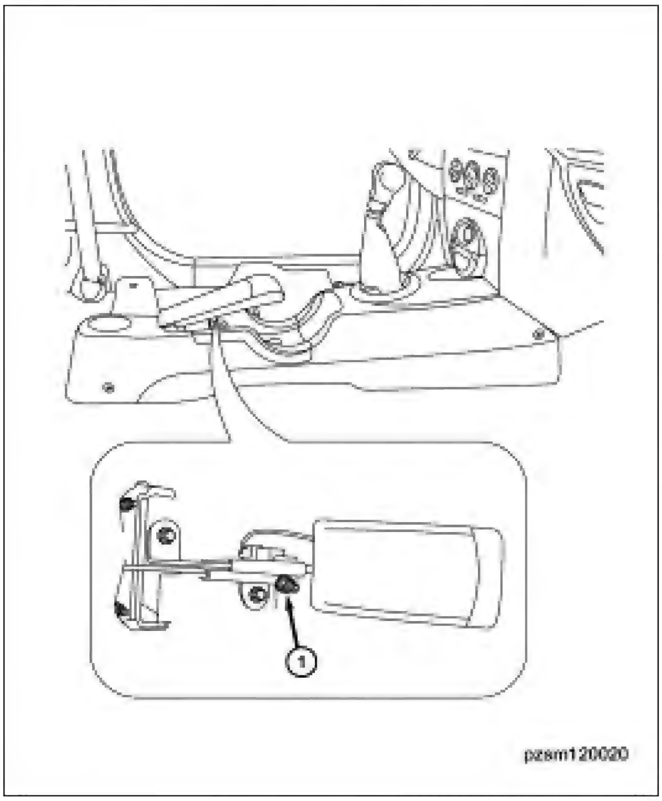
Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the rear wheel mounting nuts and both rear tire and wheel assemblies.
   (Tighten: Wheel mounting nuts to 110 N·m)
3. Remove the rear brake drum (See Rear Brake Drum Removal & Installation in Section 12 Brake).

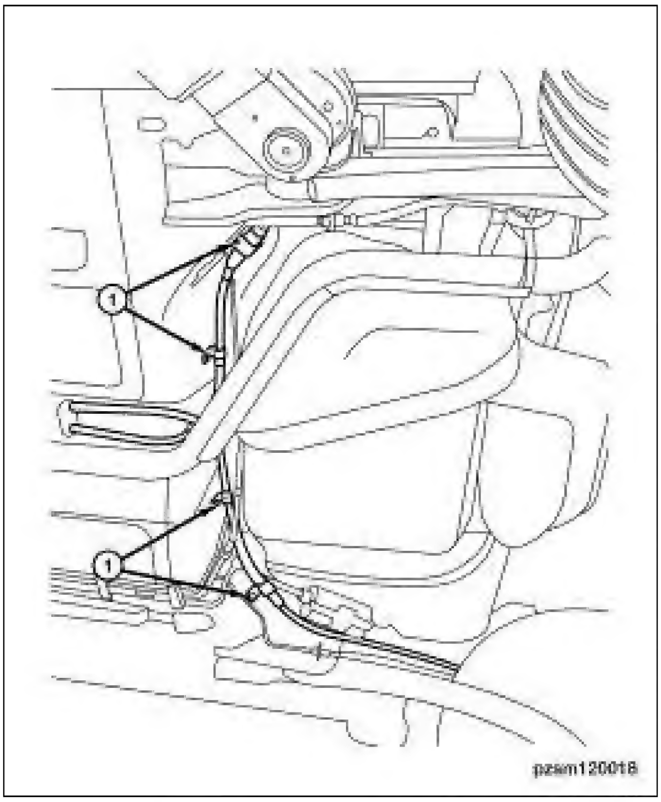
4. Remove the parking brake clip with priers (1) under the rear wheels.



5. Remove the three retaining bracket bolts of the parking brake cable. (Tighten: Parking brake cable bracket bolts to 9 - 12 N·m)
6. Remove the lower console (See Lower Console Removal & Installation in Section 15 Body & Accessories).
7. Release and lower the parking brake lever.
8. Remove the parking brake adjustment nut (1).



9. Loosen the two parking brake cables with hand.
10. Raise and support the vehicle.
11. Remove the parking brake cables retaining bolts (1).



12. Pull out the parking brake cable from the underside of the vehicle body.

    NOTE: Remove the parking brake cable at another side in accordance with the same method.
13. Installation is in the reverse order of removal.

Installation Notes:

- After installation, adjust the parking brake cable as necessary (See Parking Brake Adjustment in Section 12 Brakes).

HEATING & AIR CONDITIONING

13

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System Plumbing **13-28**

MANUAL TEMPERATURE CONTROL

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GENERAL INFORMATION

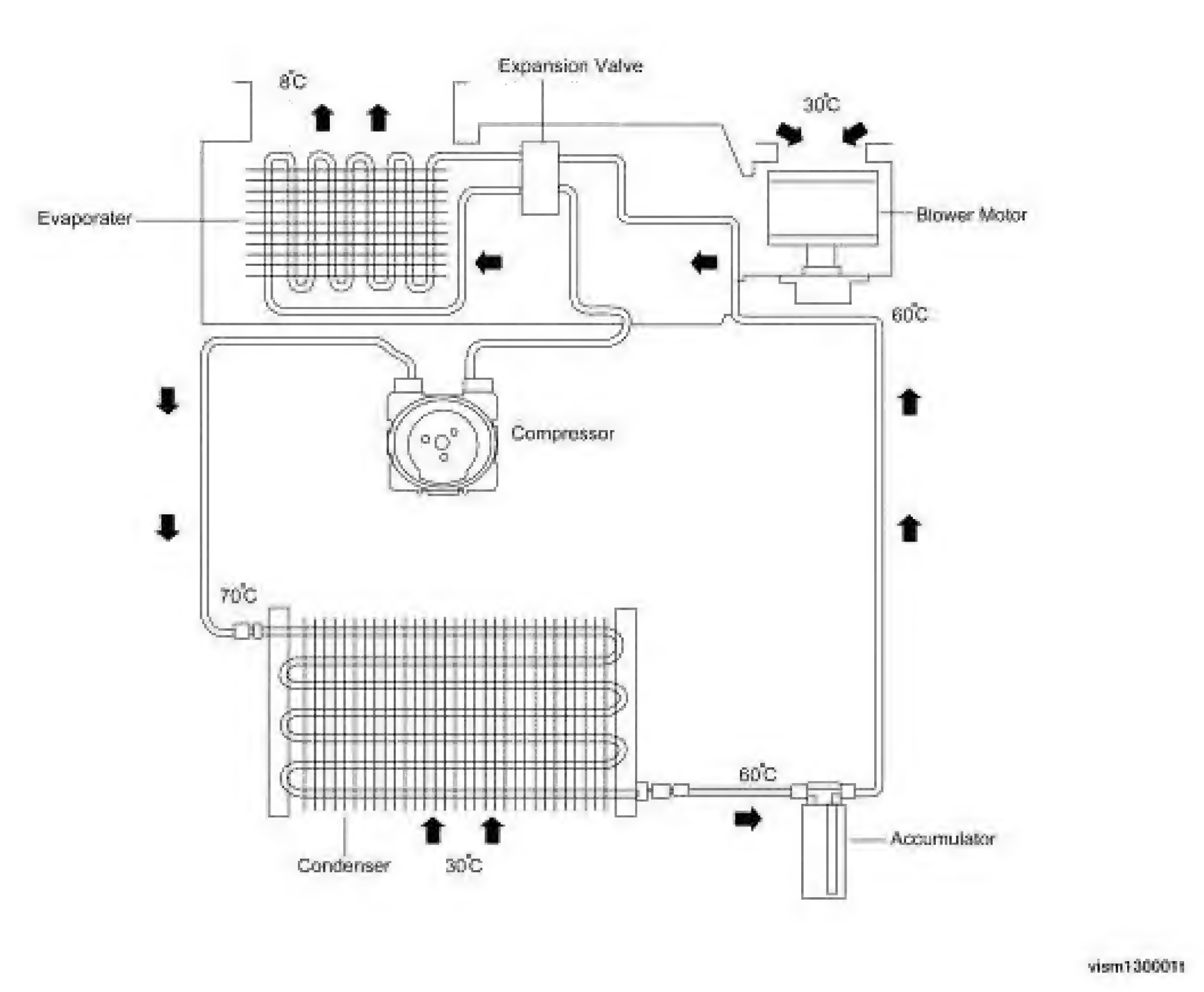
Description

This vehicle is equipped with a common Heating, Ventilation and Air Conditioning (HVAC) housing assembly. The system combines air conditioning, heating, and ventilating capabilities in a single unit housing mounted under the instrument panel. The driver can choose the following functions from the HVAC control panel:

- The inside temperature
- The speed of the blower
- Five different modes of operation
- A/C compressor clutch operation
- Recirculation door position

NOTE :
To maintain the performance level of the HVAC system, the engine cooling system must be properly maintained. Any obstructions in front of the radiator or A/C condenser will reduce the performance of the A/C and engine cooling systems.

Operation



Outside fresh air enters the vehicle through the cowl top opening at the base of the windshield, and passes through a plenum chamber to the HVAC housing. Air flow can then be adjusted by the blower motor speed switch on the HVAC control panel. The fresh air then travels through the evaporator and the heater core then out into the vehicle through the side and floor vents. It is also important to keep the air intake openings clear of debris because leaf particles and other debris that is small enough to pass through the cowl plenum screen can accumulate within the HVAC housing. The A/C compressor can be engaged by pressing the A/C (snowflake) button on the A/C-heater control. It will automatically engage when the mode control is set in any Mix to Defrost position. This will remove heat and humidity from the air before it is directed through or around the heater core. The mode control on the A/C-heater control is used to direct the conditioned air to the selected system outlets.

Specifications

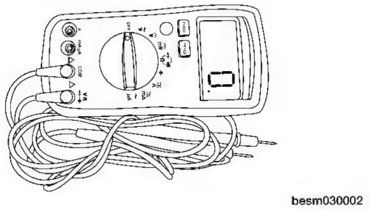
Torque Specifications

DESCRIPTION	TORQUE (N·m)
All General Service Screws	2
Accumulator Bolts	6
Condenser Nuts	6
HVAC Housing Nuts To Front Wall	4
HVAC Housing Nuts	5
Pipeline Stent	4
Refrigerant Lines To A/C Accumulator Nut	6
Refrigerant Lines To A/C Compressor Bolt	30
Refrigerant Lines To A/C Evaporator Nut	25

A/C Pressure Specifications

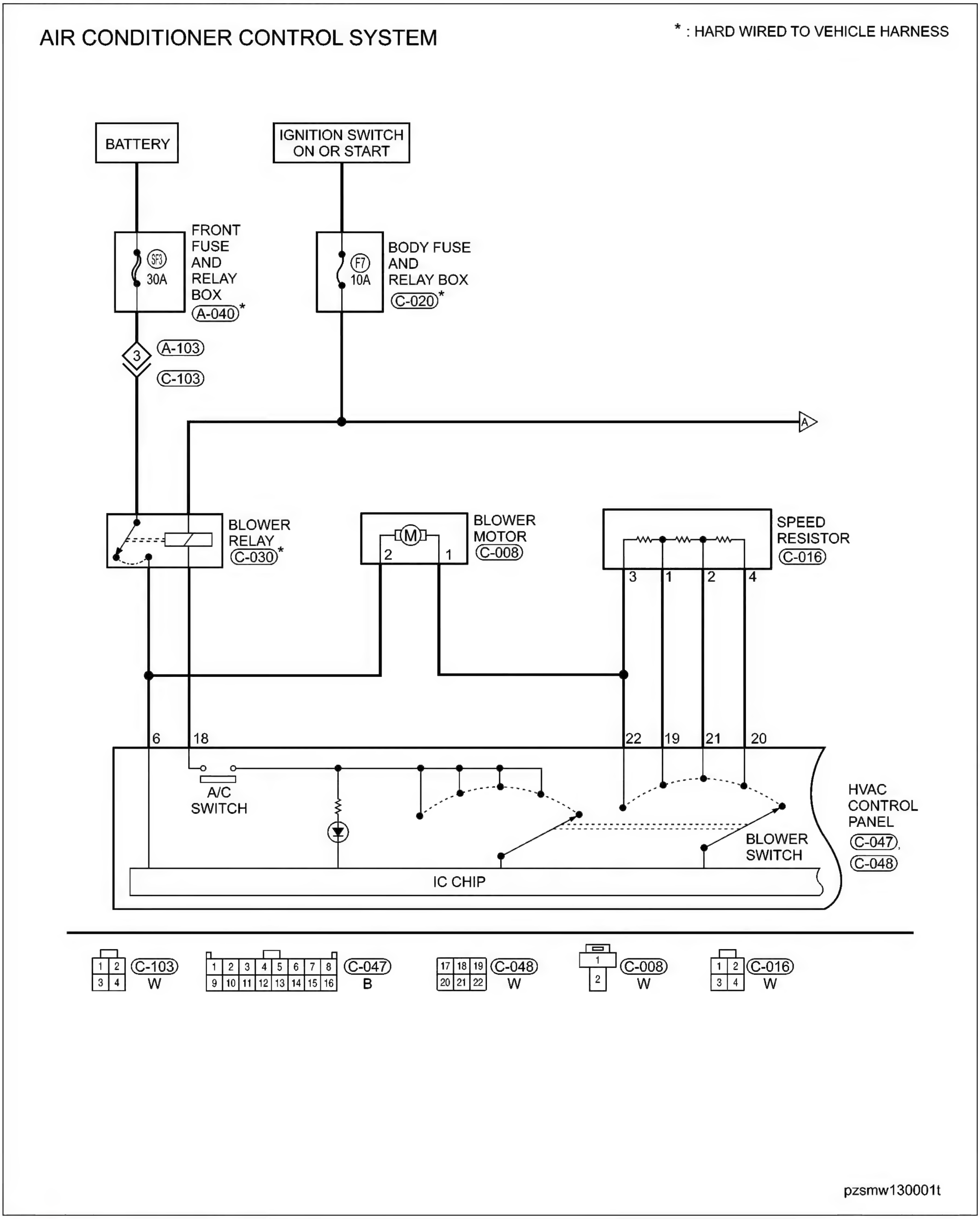
AMBIENT TEMPERATURE	A/C HIGH SIDE PRESSURE	A/C LOW SIDE PRESSURE
15.5°C	8.4-11.9 kgf/cm^2 120-170 psi	1.9-2.1 kgf/cm^2 28-31 psi
21.1°C	10.5-17.5 kgf/cm^2 150-250 psi	1.9-2.1 kgf/cm^2 28-31 psi
26.6°C	12.6-19.3 kgf/cm^2 180-275 psi	1.9-2.1 kgf/cm^2 28-31 psi
32.2°C	14.0-21.8 kgf/cm^2 200-310 psi	1.9-2.1 kgf/cm^2 28-31 psi
37.7°C	16.1-23 kgf/cm^2 230-330 psi	1.9-2.4 kgf/cm^2 28-35 psi
43.3°C	18.9-25.3 kgf/cm^2 270-360 psi	1.9-2.6 kgf/cm^2 28-38 psi

Special Tools

Digital Multimeter Fluke 15B & 17B	 besm030002

Electrical Schematics

Climate Control System (Page 1 of 2)


AIR CONDITIONER CONTROL SYSTEM
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
SF3
30A
FRONT FUSE AND RELAY BOX
A-040*
F7
10A
BODY FUSE AND RELAY BOX
C-020*
3
A-103
C-103
A
BLOWER RELAY
C-030*
M
2
1
BLOWER MOTOR
C-008
SPEED RESISTOR
C-016
3
1
2
4
6
18
22
19
21
20
A/C SWITCH
BLOWER SWITCH
IC CHIP
HVAC CONTROL PANEL
C-047,
C-048
1 2 3 4
C-103
W
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-047
B
17 18 19 20 21 22
C-048
W
1 2
C-008
W
1 2 3 4
C-016
W
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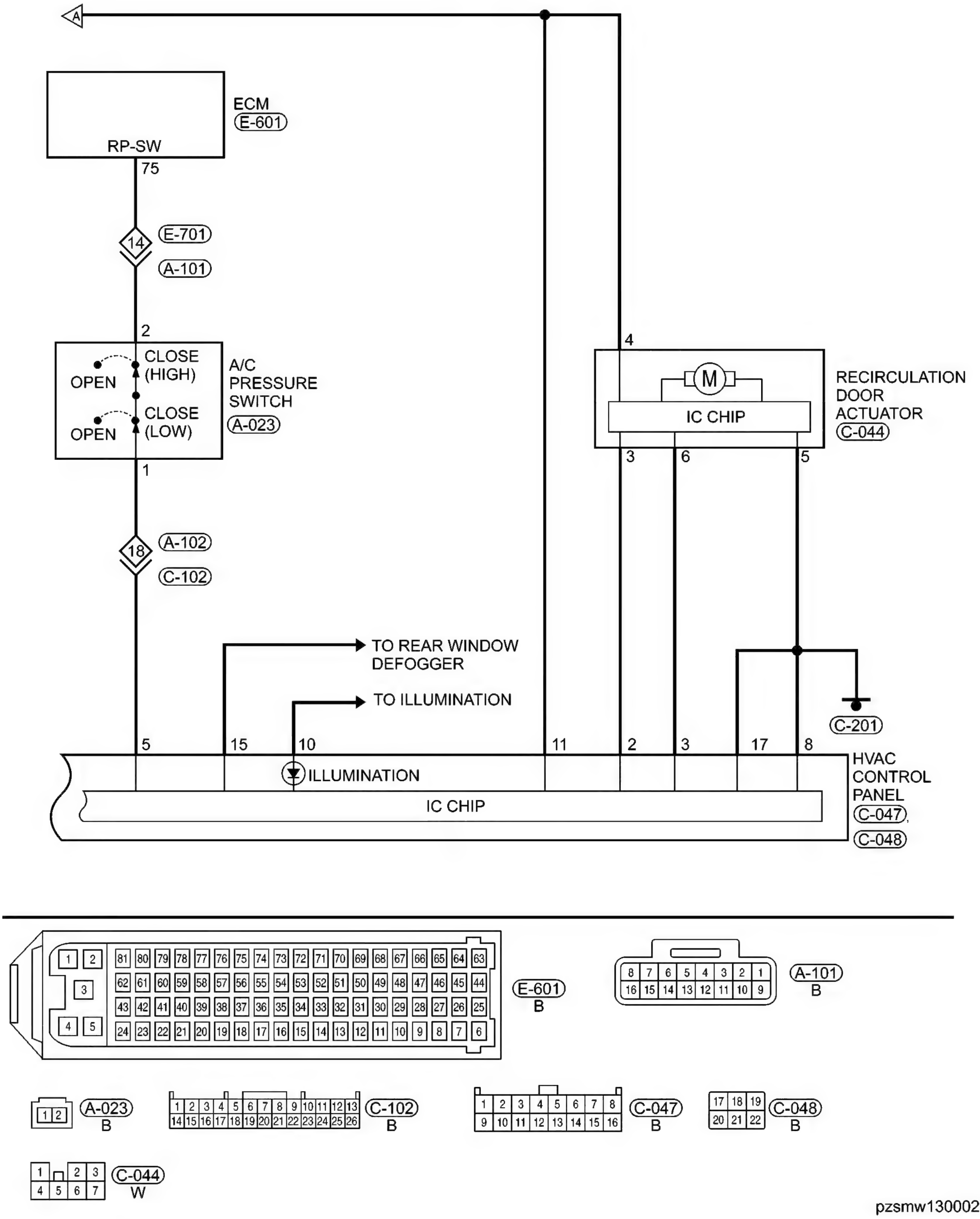
Climate Control System (Page 2 of 2)


A
ECM
E-601
RP-SW
75
14
E-701
A-101
2
CLOSE (HIGH)
OPEN
CLOSE (LOW)
OPEN
A/C PRESSURE SWITCH
A-023
1
18
A-102
C-102
4
M
IC CHIP
RECIRCULATION DOOR ACTUATOR
C-044
3
6
5
TO REAR WINDOW DEFOGGER
TO ILLUMINATION
C-201
5
15
10
11
2
3
17
8
ILLUMINATION
IC CHIP
HVAC CONTROL PANEL
C-047,
C-048
E-601
B
A-101
B
A-023
B
C-102
B
C-047
B
C-048
B
C-044
W

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DIAGNOSIS & TESTING

A/C System Performance

NOTE :
The ambient air temperature must be a minimum of 21°C for this test.

1. Connect a manifold gauge set.
2. Set the A/C Heater mode control switch knob in the Panel position, the temperature control knob in the full cool position, the A/C button in the On position, and the blower motor switch knob in the highest speed position.
3. Start the engine and hold the idle at 2,000 RPM with the compressor clutch engaged.
4. The engine should be at operating temperature. The doors and windows must be open.
5. Insert a thermometer in the driver side center A/C (panel) outlet. Operate the engine for five minutes.
6. The compressor clutch may cycle, depending upon the ambient temperature and humidity.
7. With the compressor clutch engaged, record the discharge air temperature and the compressor discharge pressure.
8. Compare the discharge air temperature to the performance temperature and pressure chart.

NOTE :
The discharge air temperatures will be lower if the humidity is less than the percentages shown.

TEMPERATURE AND PRESSURE					
Ambient Air Temperature and Humidity	21°C (80% humidity)	27°C (80% humidity)	32°C (80% humidity)	38°C (50% humidity)	43°C (20% humidity)
Air Temperature at Center Panel Outlet	10 to 13°C	14 to 17°C	15 to 18°C	17 to 20°C	14 to 17°C
Evaporator Inlet Pressure at Charge Port	241 to 276 kPa	262 to 290 kPa	269 to 296 kPa	275 to 303 kPa	262 to 290 kPa
Compressor Discharge Pressure	1241 to 1792 kPa	1380 to 1930 kPa	1380 to 1930 kPa	1655 to 2206 kPa	1567 to 2068 kPa

A/C System Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Rapid Compressor Clutch Cycling (ten or more cycles per minute)	· Low refrigerant system charge.	· Test the A/C system for leaks. Repair, evacuate and charge the refrigerant system, if required.
Equal Pressures, But The Compressor Clutch Does Not Engage	· No refrigerant in the refrigerant system. · Faulty A/C compressor clutch coil. · Faulty A/C pressure transducer. · Faulty HVAC control module.	· Test the A/C system for leaks. Repair, evacuate and charge the A/C, if required. · Test the compressor clutch coil and replace, if required. · Test the A/C high pressure transducer and replace, if required. · Test the HVAC control module and replace, if required.
Normal Pressures, But A/C Performance Test Air Temperatures At Center Panel Outlet Are Too High	· Excessive refrigerant oil in system. · Blend door inoperative or sealing improperly. · Blend door actuator faulty or inoperative.	· Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required. · Inspect the blend door for proper operation and sealing. Correct, if required. · Replace if faulty.
The Low Side Pressure Is Normal Or Slightly Low, And The High Side Pressure Is Too Low	· Low refrigerant system charge. · Refrigerant flow through the accumulator is restricted. · Refrigerant flow through the evaporator is restricted. · Faulty compressor.	· Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. · Replace the restricted accumulator, if required. · Replace the restricted evaporator coil, if required. · Replace the compressor, if required.
The Low Side Pressure Is Normal Or Slightly High, And The High Side Pressure Is Too High	· Condenser air flow restricted. · Inoperative cooling fan. · Refrigerant system overcharged. · Air in the refrigerant system. · Engine overheating.	· Check the condenser for damaged fins, foreign objects obstructing air flow through the condenser fins, and missing or improperly installed air seals. Clean, repair, or replace components as required. · Test the cooling fan and replace, if required. · Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required. · Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. · Test the cooling system and repair as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
The Low Side Pressure Is Too High, And The High Side Pressure Is Too Low	· Accessory drive belt slipping. · Faulty compressor.	· Inspect the accessory drive belt condition and tension. Tighten or replace the accessory drive belt, if required. · Replace the compressor, if required.
The Low Side Pressure Is Too Low, And The High Side Pressure Is Too High	· Restricted refrigerant flow through the refrigerant lines. · Restricted refrigerant flow through the A/C accumulator. · Restricted refrigerant flow through the condenser.	· Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant line, if required. · Replace the accumulator if restricted. · Replace the restricted condenser, if required.

Heater Performance

Engine coolant is delivered to the heater core through heater hoses. With the engine idling at normal operating temperature, set the temperature control knob in the full hot position, the mode control switch knob in the floor heat position, and the blower motor switch knob in the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the HVAC housing floor outlets. Compare the test thermometer reading to the heater performance chart.

HEATER PERFORMANCE				
Ambient Air Temperature	15.5°C (60°F)	21.1°C (70°F)	26.6°C (80°F)	32.2°C (90°F)
Minimum Air Temperature at Floor Outlet	62.2°C (144°F)	63.8°C (147°F)	65.5°C (150°F)	67.2°C (153°F)

Both of the heater hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system.

Obstructed Coolant Flow

Possible locations or causes of obstructed coolant flow:
- Pinched or kinked heater hoses.
- Improper heater hose routing.
- Plugged heater hoses or supply and return ports at the cooling system connections.
- A plugged heater core.

Mechanical Problems

Possible locations or causes of insufficient heat:
- An obstructed cowl air intake.
- Obstructed heater system outlets.
- A blend door not functioning properly.
- Air trapped in the cooling system.

Temperature Control

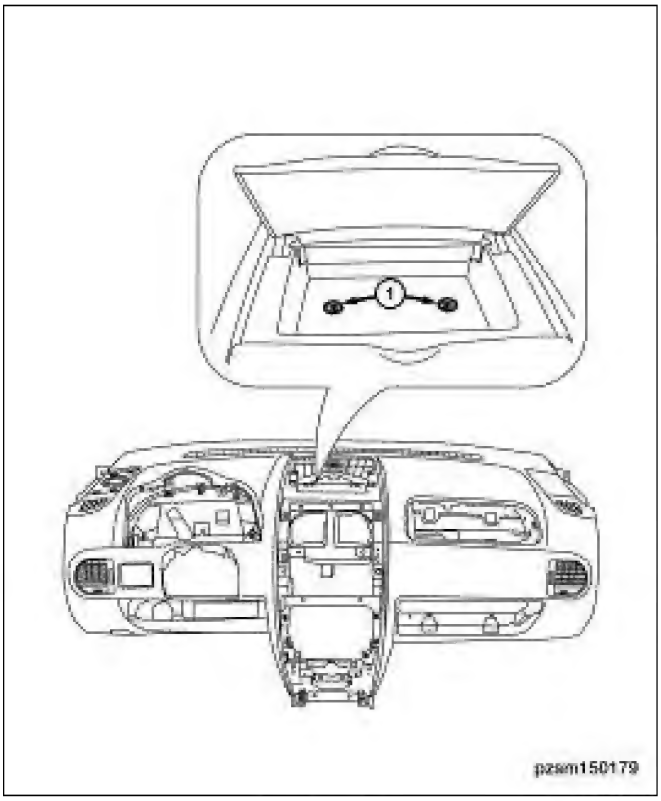
If the heater outlet air temperature cannot be adjusted with the temperature control knob(s) on the A/C Heater control panel, the following could require service:
- The HVAC control panel.
- The blend door actuator(s).
- The wire harness circuits for the HVAC control or the blend door actuator(s).
- The blend door(s).
- Improper engine coolant temperature.

ON-VEHICLE SERVICE

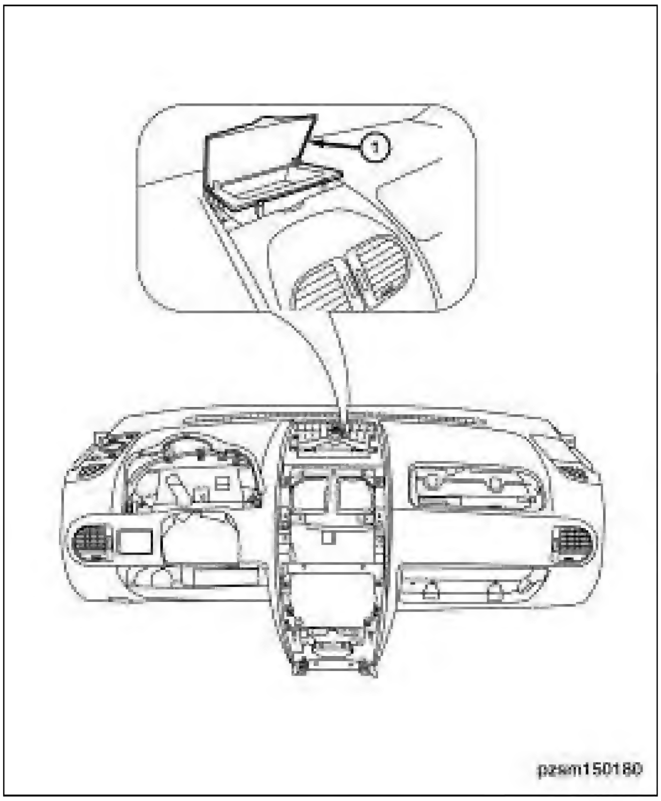
Manual Temperature Control Module

Removal & Installation

1. Disconnect the negative battery cable.
2. Open the upper storage box and remove the two screws (1).



3. Remove the upper storage box (1).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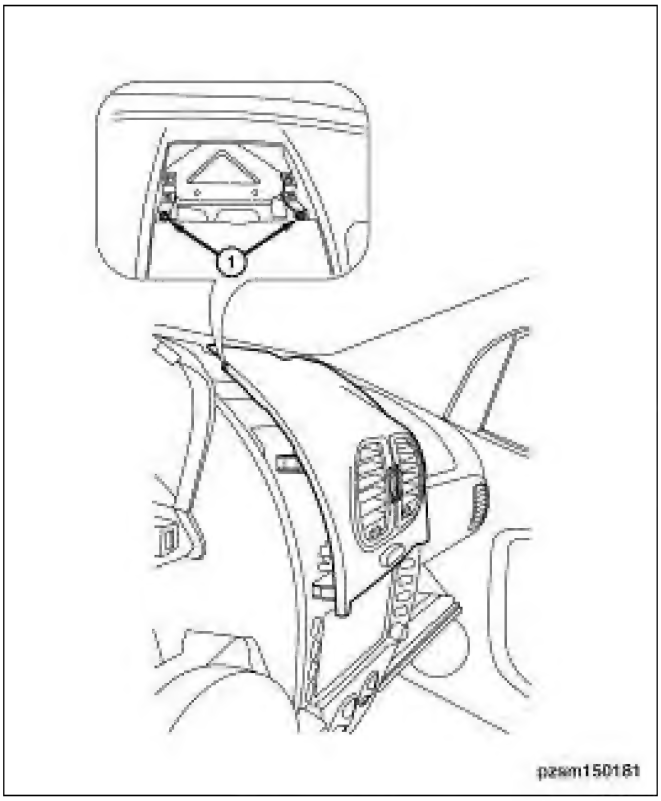
4. Remove the two upper cover retaining screws (1).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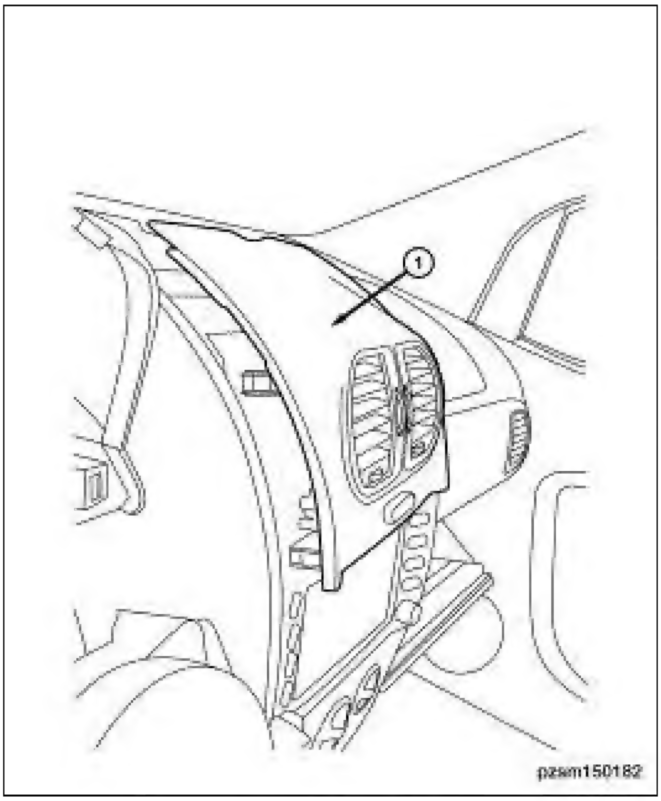
5. Using a trim stick, pry the lower cover.

6. Remove the center instrument panel cover (1).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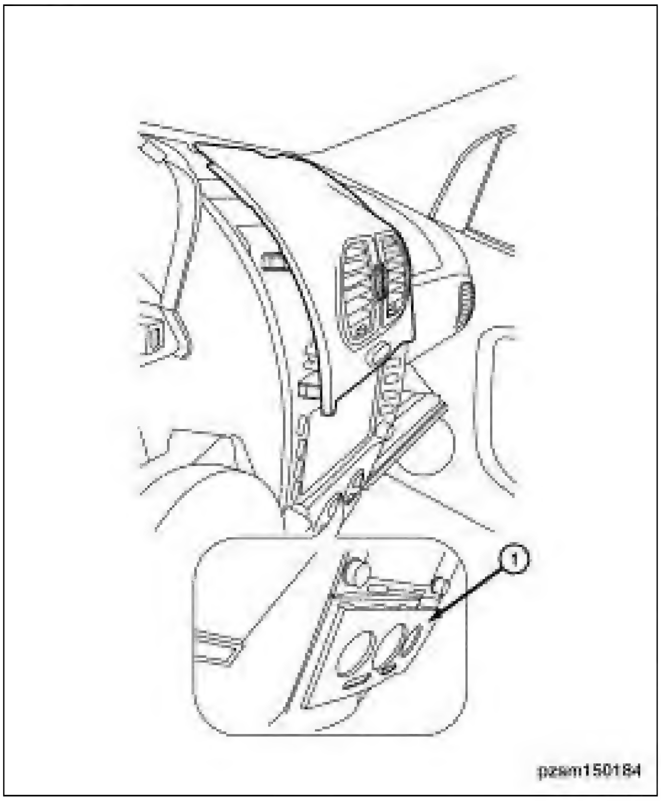
7. Disconnect the hazard warning switch electrical connector.
8. Remove the HVAC control panel cover (1).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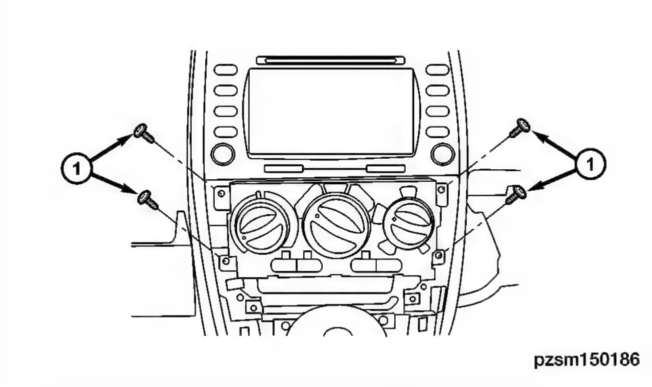
9. Remove the four HVAC control panel retaining screws (1).



10. Disconnect the two electrical connectors behind the HVAC control panel and the two control cables.
11. Remove the HVAC control panel.
12. Installation is in the reverse order of removal.

Blower Motor Resistor

Removal & Installation

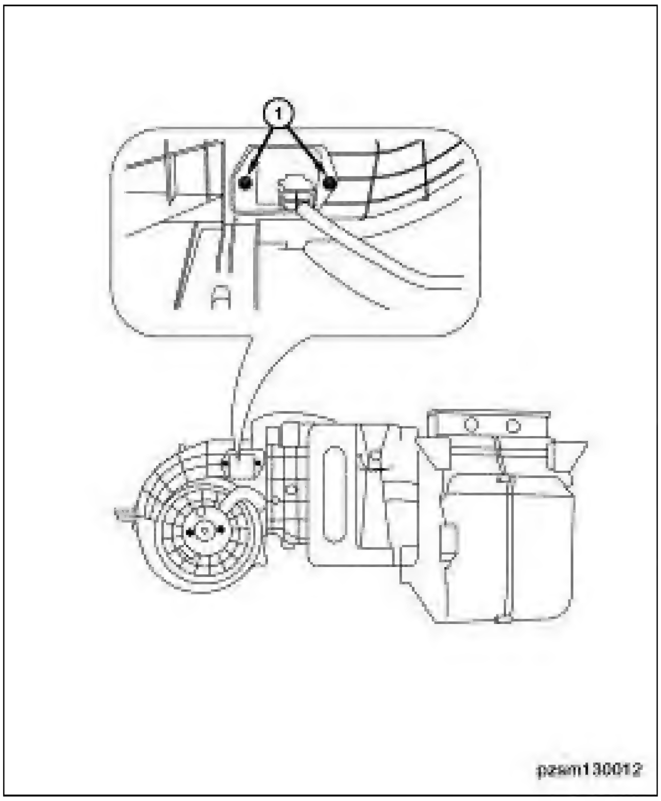
WARNING!

The blower motor resistor may get very hot during normal operation. If the blower motor was turned on prior to servicing the blower motor resistor, wait five minutes to allow the blower motor resistors to cool before performing diagnosis or service. Failure to take this precaution can result in possible personal injury.

CAUTION:
Do not operate the blower motor with the blower motor resistor removed from the circuit. Failure to take this precaution can result in vehicle damage.

1. Disconnect the negative battery cable.
2. Disconnect the blower motor resistor electrical connector from the bottom of the left side of the instrument panel.

3. Remove the two screws (1) attaching the blower motor resistor to the HVAC housing.



4. Remove the blower motor resistor.
5. Installation is in the reverse order of removal.

SYSTEM CONTROLS

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GENERAL INFORMATION

Description

The Heating, Ventilation and Air Conditioning (HVAC) system uses a combination of electrical and vacuum controls. These controls provide the vehicle operator with a number of setting options to help control the climate and comfort within the vehicle. Refer to the owner's manual in the vehicle glove box for more information on the suggested operation and use of these controls.

Operation

The HVAC control panel is located on the instrument panel above the radio. The HVAC control panel contains the following control switches:

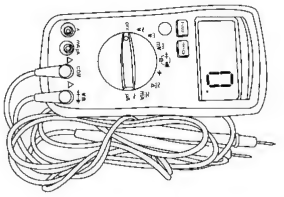
- Temperature control
- Mode control
- Blower motor speed switch
- A/C compressor switch
- Recirculation switch
- Rear defogger switch

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
Recirculation Door Actuator Screws	2

Special Tools

Digital Multimeter Fluke 15B & 17B	 besm030002

DIAGNOSIS & TESTING

Mechanical Problems

Possible locations or causes of insufficient heat:

- An obstructed cowl air intake.
- Obstructed heater system outlets.
- A blend door not functioning properly.
- An air-bound system.

Temperature Control

If the heater outlet air temperature cannot be adjusted with the temperature control knob(s) on the HVAC control panel, the following could require service:

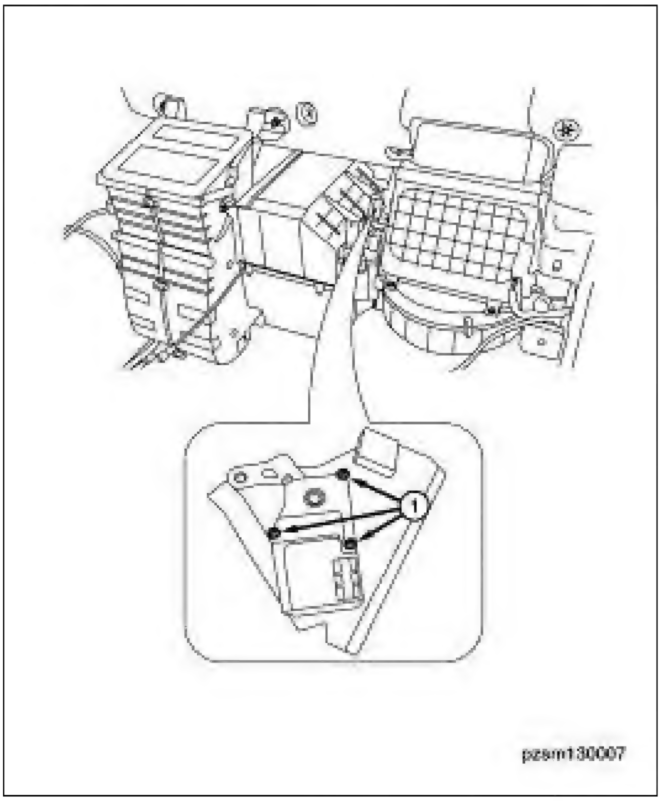
- The HVAC control panel.
- The blend door cable.
- The mode door cable.
- The electrical circuits for the HVAC control panel.
- Improper engine coolant temperature.

ON-VEHICLE SERVICE

Recirculation Door Actuator

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the instrument panel (See Instrument Panel Removal & Installation in Section 15 Body & Accessories).
3. Remove the HVAC housing (See HVAC Housing Removal & Installation in Section 13 Heating & Air Conditioning).
4. Disconnect the recirculation door actuator harness connector.
5. Remove the three screws (1) from the recirculation door actuator.
   (Tighten: Recirculation door actuator screws to 2 N·m)



6. Remove the plastic clip from the recirculation door actuator.
7. Remove the recirculation door actuator.
8. Installation is in the reverse order of removal.

Installation Notes:

- Turn the ignition switch to the ACC position.
- Start the engine and turn on the air conditioner.
- Set the air conditioner temperature adjusting knob to HOTTEST or COLDEST temperature setting.
- Close the air conditioner panel until the motor stops.
- Adjust the mixing damper manually to HOTTEST or COLDEST temperature setting.
- Adjust the rod to align with the recirculation door actuator.
- Attach the rod to the recirculation door actuator.

AIR DISTRIBUTION

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  - Removal & Installation 13-23
- Blower Motor 13-26
  - Description 13-26
  - Operation 13-26
  - Removal & Installation 13-26

GENERAL INFORMATION

Description

All models are equipped with a common Heating, Ventilation and Air Conditioning (HVAC) housing assembly that combines A/C and heating capabilities into a single unit mounted within the passenger compartment. The HVAC housing assembly consists of three separate housings:

- HVAC housing — The HVAC housing is mounted to the dash panel behind the instrument panel and contains the A/C evaporator. The HVAC housing has mounting provisions for the air inlet housing, blower motor and the air distribution housing.
- Air distribution housing — The air distribution housing is mounted to the rear of the HVAC housing and contains the heater core, blend-air and mode-air doors and door linkage.
- Air inlet housing — The air inlet housing is mounted to the passenger side end of the HVAC housing. The air inlet housing contains the recirculation-air door and actuator.

Operation

The A/C system is designed for the use of a non-CFC, R-134a refrigerant and uses an A/C evaporator to cool and dehumidify the incoming air prior to blending it with the heated air. Temperature control determines the discharge air temperature by operating the temperature control cable, which moves the blend-air door. This allows an almost immediate control of the output air temperature of the system. The mode door cable operates the mode-air doors which direct the flow of the conditioned air out the various air outlets, depending on the mode selected. When equipped with A/C, the recirculation door actuator operates the recirculation-air door which closes off the fresh air intake and recirculates the air already inside the vehicle. The electric recirculation door actuator and the blower motor are connected to the vehicle electrical system by the instrument panel wire harness. The blower motor controls the velocity of air flowing through the HVAC housing assembly by spinning the blower wheel within the HVAC housing at the selected speed by use of the blower motor resistor, which is located in the dash panel in the engine compartment.

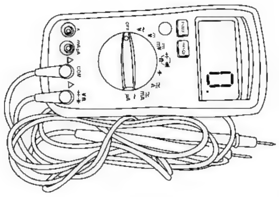
The air distribution housing must be removed from the HVAC housing and disassembled for service of the blend-air and mode-air doors. The air inlet housing must be removed from the HVAC housing and disassembled for service of the recirculation-air door. The HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
All General Service Screw	2
Accumulator Bolts	6
Condenser Nuts	6
HVAC Housing Nuts To Front Wall	4
HVAC Housing Nuts	5
Pipeline Stent	4
Refrigerant Lines To A/C Accumulator Nut	6
Refrigerant Lines To A/C Compressor Bolt	30
Refrigerant Lines To A/C Evaporator Nut	25

Special Tools

Digital Multimeter Fluke 15B & 17B	 besm030002

DIAGNOSIS & TESTING

Blower Motor Electrical Troubleshooting

To determine if an open condition exists within the blower motor circuit wiring, it is necessary to disconnect the negative battery cable and check for continuity within the blower motor circuits using an ohmmeter.

Possible causes of an inoperative blower motor include the following:
- Open fuse
- Inoperative blower motor switch
- Inoperative blower motor
- Inoperative blower motor resistor
- Inoperative blower motor circuit wiring or wiring harness electrical connectors

Blower Motor Noise

To determine if the blower motor is the source of the noise, simply switch the blower motor from Off to On. To verify that the blower motor is the source of the noise, unplug the blower motor wire harness connector and operate the heater-A/C system. If the noise goes away, possible causes include:
- Foreign material on fresh air inlet screen
- Foreign material in blower wheel
- Foreign material in HVAC housing
- Incorrect blower motor mounting
- Deformed or damaged blower wheel
- Worn blower motor bearings or brushes

Blower Motor Vibration

Possible causes of a blower motor vibration include:
- Incorrect blower motor mounting
- Foreign material in blower wheel
- Deformed or damaged blower wheel
- Worn blower motor bearings

ON-VEHICLE SERVICE

HVAC Housing

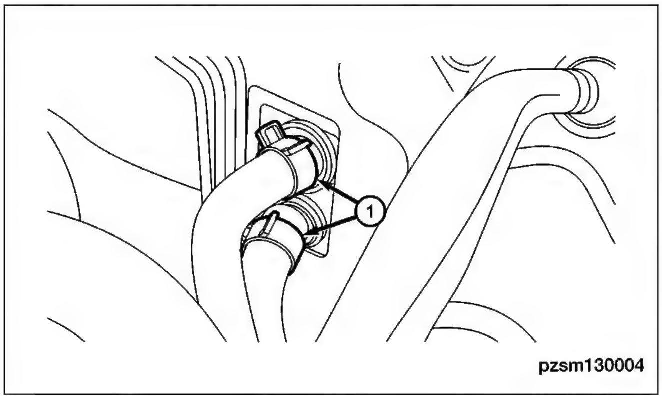
Removal & Installation

1. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).

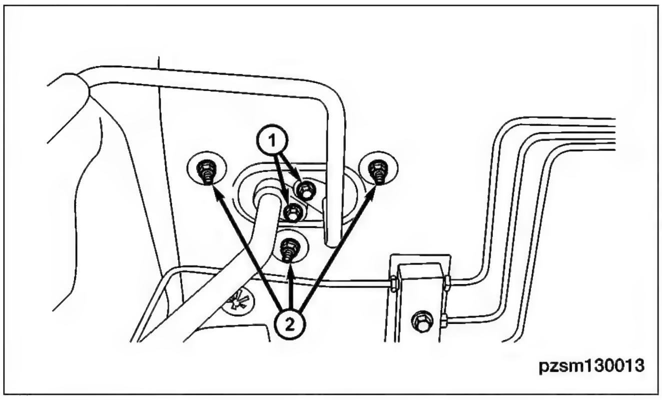
WARNING!

Always allow the engine to cool before opening the cooling system. Do not loosen the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

2. Drain the cooling system (See Cooling System Draining Procedure in Section 06 Cooling System).
3. Remove the two heater hose clamps (1) and remove the two heater hoses.

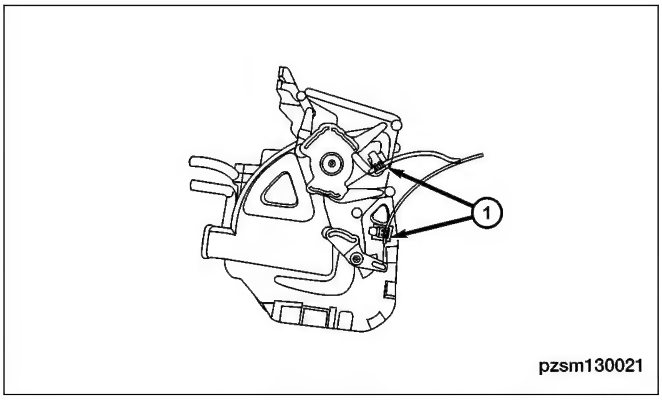


4. Remove the two A/C pressure line mounting nuts (1).
5. Remove the three HVAC housing retaining nuts (2).



6. Remove the instrument panel (See Instrument Panel Removal & Installation in Section 15 Body & Accessories).

7. Remove the mode door and the blend door cable clamps (1) and remove the two cables.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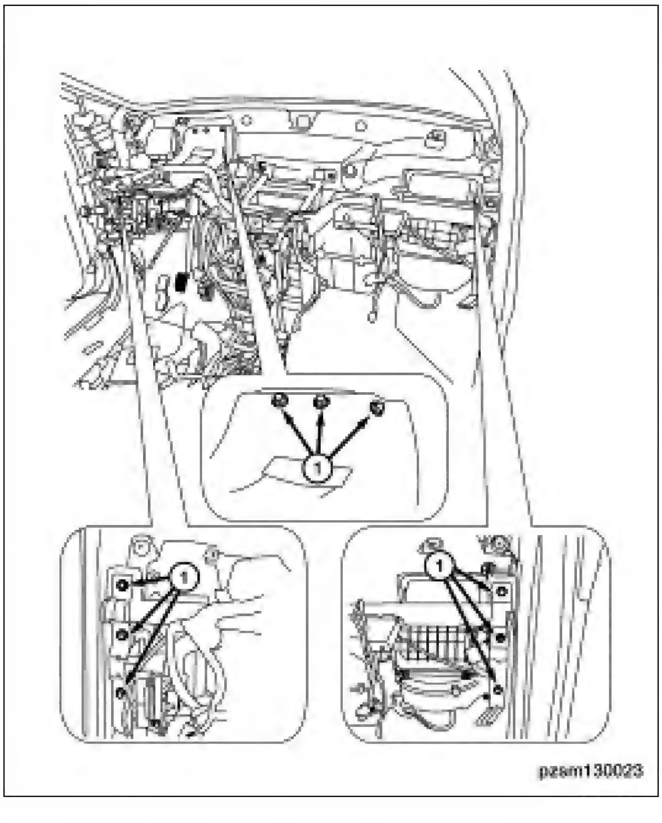
8. Remove the steering assembly mounting bolts and nuts (1).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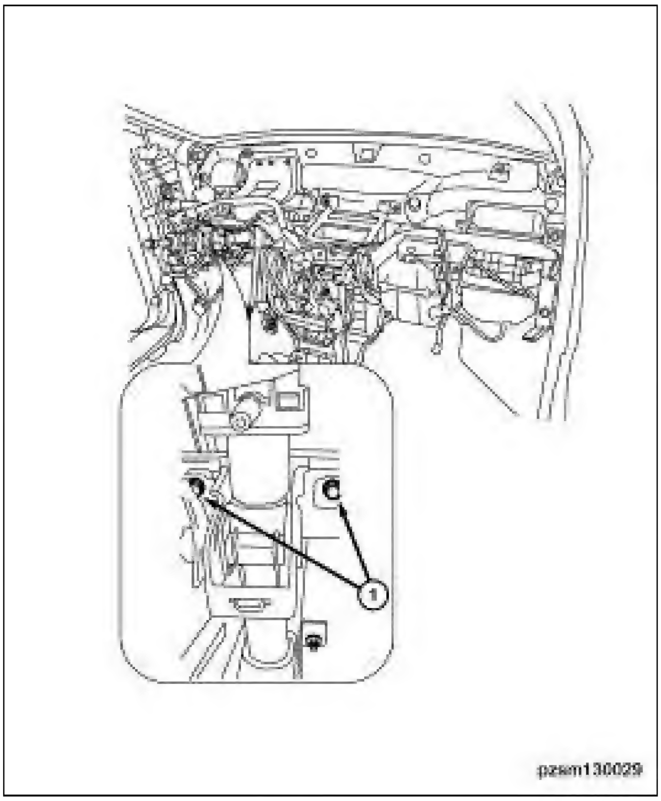
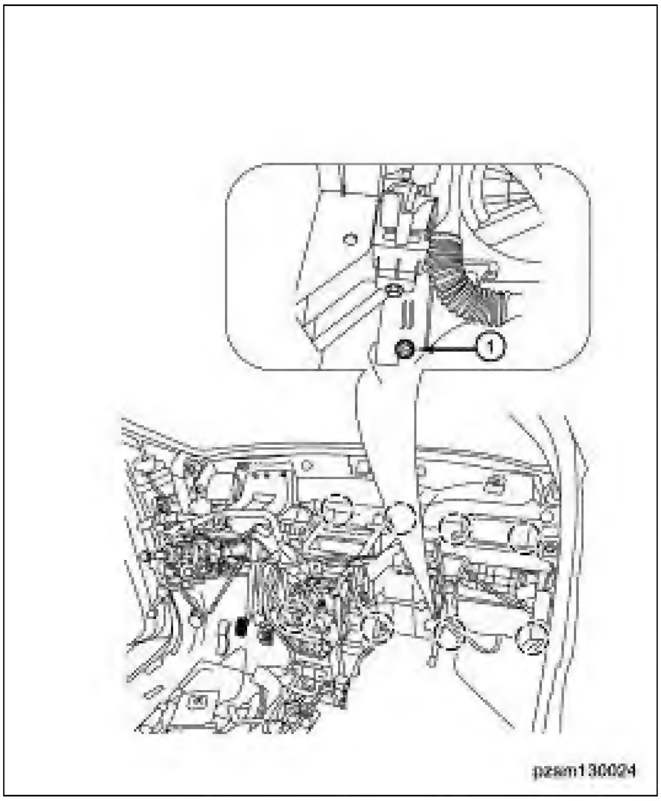
9. Remove the steering column retaining bolts (1).



10. Remove the steering assembly carefully.
11. Remove the eight HVAC housing assembly retaining nuts (1).



12. Remove the inlet and outlet A/C pressure line snap rings from the evaporator, and remove the A/C pressure lines.
13. Remove the HVAC housing assembly.

14. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).

Blower Motor

Description

The blower motor is mounted in the HVAC housing. The following are blower motor functions:

- The blower motor will operate whenever the ignition switch is in the ON position and the blower motor control is in any position except Off.
- The blower motor can be accessed for service from underneath the instrument panel.
- The blower motor and blower motor wheel are factory balanced as an assembly and cannot be adjusted or repaired and must be replaced if found inoperative or damaged.

Operation

The blower motor is used to control the velocity of air moving through the HVAC housing by spinning the blower wheel within the HVAC air inlet housing at the selected speed. The blower motor is a 12-volt, direct current (DC) motor mounted within a plastic housing with an integral wire harness connector. The blower wheel is secured to the blower motor shaft and is positioned within the air inlet housing on the passenger side of the HVAC housing.

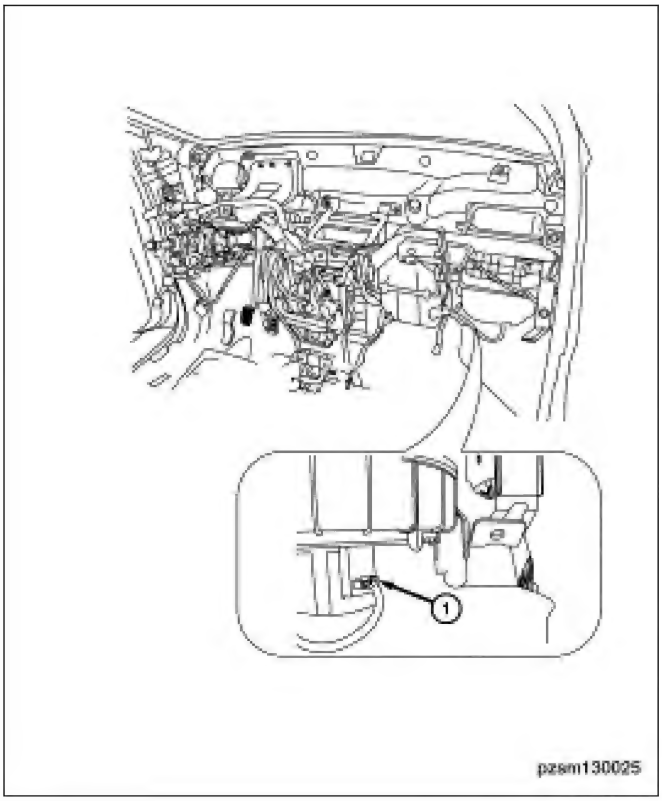
Removal & Installation

NOTE :

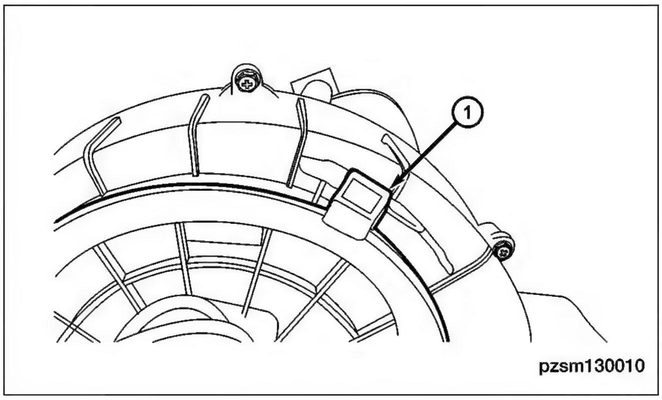
The blower motor is located on the bottom of the HVAC housing. The blower motor can be removed from the vehicle without having to remove the HVAC housing.

1. Disconnect the negative battery cable.

2. Disconnect the blower motor electrical connector (1) from the bottom of the left side of the instrument panel.



3. Push down on the clip (1) and remove the blower assembly clockwise.



4. Remove the blower motor.
5. Installation is in the reverse order of removal.

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GENERAL INFORMATION

Description

The A/C refrigerant lines and hoses are used to carry the refrigerant between the various A/C system components.

Any kinks or sharp bends in the refrigerant lines and hoses will reduce the capacity of the entire A/C system and can reduce the flow of refrigerant within the system.

Operation

High pressures are produced in a refrigerant system when the A/C compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all the flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed. Depending on the vehicle, model and market application, refrigerant lines are connected to each other or other A/C system components with block-type or quick-connect type fittings. To ensure the integrity of the refrigerant system, O-rings and/or gaskets may be used to seal the refrigerant system connections. The refrigerant lines and hoses cannot be repaired and must be replaced if leaking or damaged.

WARNING!

The A/C system contains refrigerant under high pressure. Repairs should only be performed by qualified service personnel. Serious or fatal injury may result from improper service procedures.

WARNING!

If accidental A/C system discharge occurs, ventilate the work area before resuming service. Large amounts of refrigerant released in a closed work area will displace the oxygen and cause suffocation and serious or fatal injury.

CAUTION:
Never add R-12 to a refrigerant system designed to use R-134a. Do not use R-12 equipment or parts on an R-134a A/C system. These refrigerants are not compatible and damage to the A/C system will result.

CAUTION:
Never use R-12 refrigerant oil in an A/C system designed to use R-134a refrigerant oil. These refrigerant oils are not compatible and damage to the A/C system will result.

CAUTION:
Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

CAUTION:
Do not overcharge the refrigerant system. Overcharging will cause excessive compressor head pressure and can cause compressor noise and A/C system failure.

Specifications

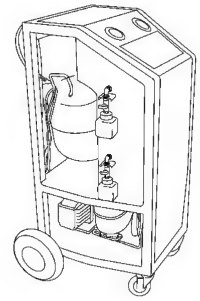
Torque Specifications

DESCRIPTION	TORQUE (N·m)
A/C Compressor Bracket Bolts	40
A/C Compressor Line Bolts	20

A/C Refrigerant Charge Specifications

DESCRIPTION	CAPACITY (g)
R-134a Refrigerant	500 ± 10

Special Tools

Refrigerant Recovery/Recycling Station	 ltsm130018

DIAGNOSIS & TESTING

A/C Compressor Noise Testing

When investigating an A/C system related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transaxle in gear or neutral, engine speed, engine temperature, and any other special conditions. Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed bearing, may be caused by loose bolts, nuts, mounting brackets or a loose compressor assembly.

NOTE :
The A/C compressor must be replaced if any unusual noise is heard from the compressor itself.

NOTE :
Drive belts are speed sensitive. At different engine speeds and depending upon drive belt tension, drive belts can develop noises that are mistaken for an A/C compressor noise. Improper drive belt tension can cause a misleading noise when the compressor is operating at maximum displacement, which may not occur when the compressor is at minimum displacement.

1. Select a quiet area for testing.
2. Duplicate the complaint conditions as much as possible.
3. Turn the A/C system On and Off several times to clearly identify any compressor noise.
4. Listen to the A/C compressor while it is operating at maximum and minimum displacement.
5. Probe the A/C compressor with an engine stethoscope or a long screwdriver with the handle held to your ear to better localize the source of the noise.
6. To duplicate high-ambient temperature conditions (high head pressure), restrict the air flow through the A/C condenser. Install a manifold gauge set or a scan tool to ensure that the discharge pressure does not exceed 2600 kPa.
7. Check the condition of the accessory drive belt.

   NOTE: The A/C compressor must be replaced if the drive hub is broken or if the compressor shaft does not rotate smoothly.
8. Check the compressor hub and pulley and bearing assembly. Ensure that the hub and pulley are properly aligned and that the pulley bearing is mounted securely to the A/C compressor.
9. Check the refrigerant system plumbing for incorrect routing, rubbing or interference, which can cause unusual noises. Also check the refrigerant lines and hoses for kinks or sharp bends that will restrict refrigerant flow, which can cause noises.
10. Loosen all of the compressor mounting hardware and retighten.
    CAUTION: Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.
11. If the noise is from the opening and closing of the high pressure relief valve, recover, evacuate and recharge the refrigerant system. If the high pressure relief valve still does not seat properly, replace the A/C compressor.
12. If the noise is from liquid refrigerant slugging in the A/C suction line, replace the A/C accumulator and check the refrigerant oil level and the refrigerant system charge.
13. If a slugging condition still exists after replacing the A/C accumulator, then replace the A/C compressor.

Refrigerant System Leaks

WARNING!

R-134a service equipment or the vehicle A/C system should not be pressure tested or leak tested with compressed air. Mixture of air and R-134a can be combustible at elevated pressures. These mixtures are potentially dangerous and may result in fire or explosion causing property damage, personal injury or death. Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Use only approved service equipment meeting SAE requirements to discharge an R-134a system. If accidental system discharge occurs, ventilate work area before resuming service.

NOTE :
If the A/C refrigerant system charge is empty or low, a leak in the A/C system is likely. Visually inspect all A/C lines, fittings and components for an oily residue. Oil residue can be an indicator of an A/C system leak location.

NOTE :
The only way to correctly determine if the refrigerant system is fully charged with R-134a is to completely evacuate and recharge the A/C system.

Refrigerant System Empty

1. Evacuate the refrigerant system to the lowest degree of vacuum possible. Determine if the system holds a vacuum for 15 minutes. If vacuum is held, a leak is probably not present. If system will not maintain vacuum level, proceed to STEP 2.
2. Prepare and dispense 0.22 kilograms of R-134a refrigerant into the evacuated refrigerant system and proceed to STEP 1 of the System Low procedure.

Refrigerant System Low

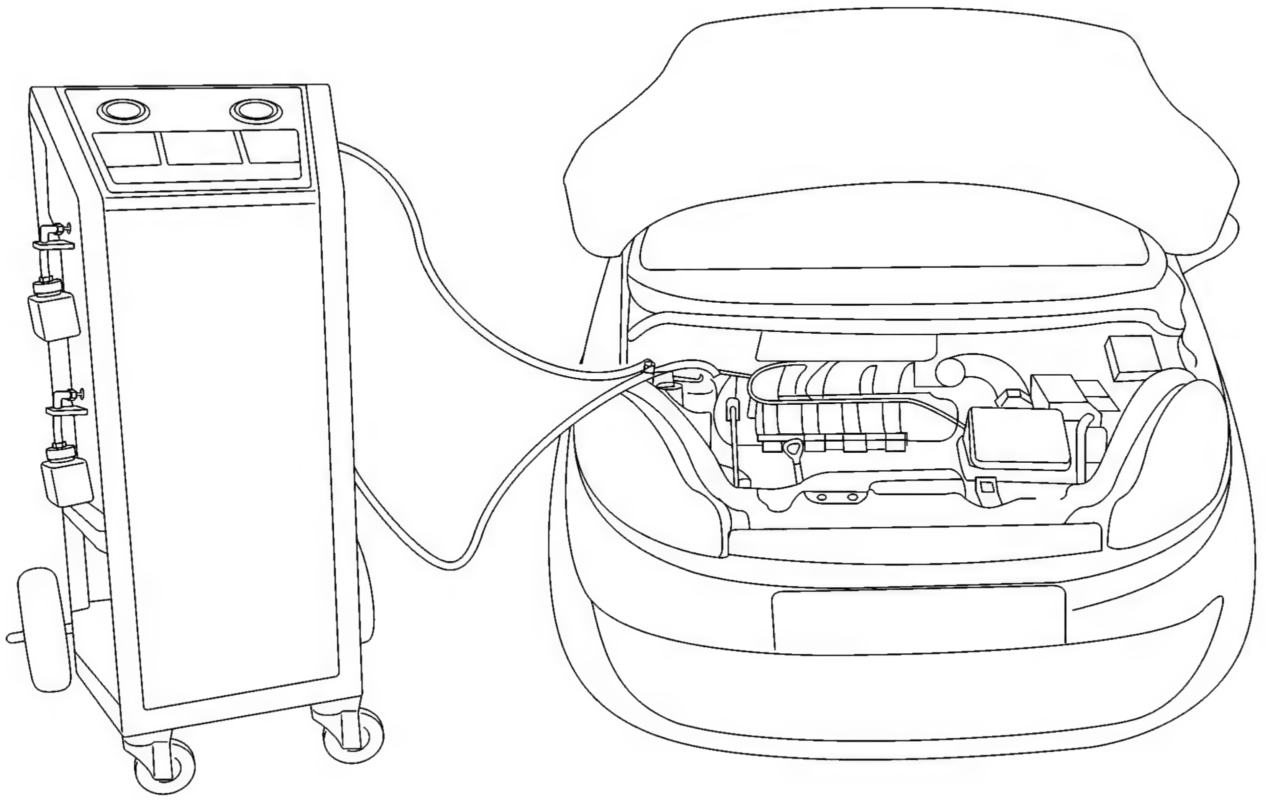
1. Position the vehicle in a wind-free work area. This will aid in detecting small leaks.
2. Operate the heating-A/C system with the engine at idle under the following conditions for at least 5 minutes:
   - Doors or windows open
   - Transaxle in Neutral with the parking brake set
   - A/C-heater controls set to outside air, full cool, panel mode, high blower
   - A/C compressor engaged
3. Shut the vehicle Off and wait 2-7 minutes. Then use an electronic leak detector that is designed to detect R-134a refrigerant and search for leaks. Fittings, lines or components that appear to be oily usually indicate a refrigerant leak. To inspect the A/C evaporator for leaks, insert the leak detector probe into the drain tube opening or an air outlet. A dye for R-134a is available to aid in leak detection. Use only approved refrigerant dye.

CAUTION:
A leak detector only designed for R-12 refrigerant will not detect leaks in an R-134a refrigerant system.

ON-VEHICLE SERVICE

A/C System Evacuation and Recharge

Connecting Refrigerant Recovery/Recycling Station



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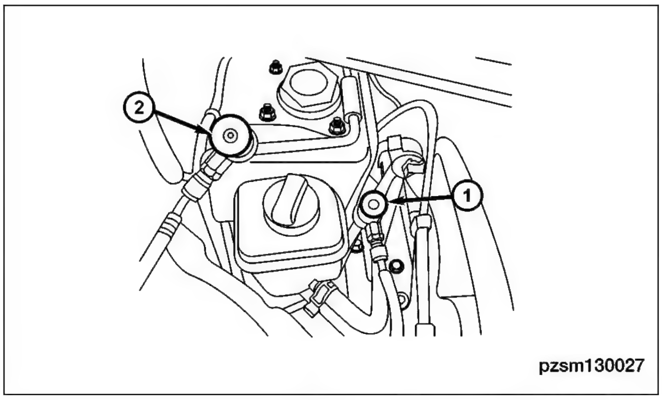
WARNING!
The A/C system is under high pressure, use caution when servicing the A/C system.

1. Connect the refrigerant recovery/recycling station to the vehicles high and low side A/C line connectors.

   NOTE: The refrigerant recovery/recycling station connectors are connected to the vehicle in the following way:

- BLUE connector (1) is connected to the A/C low side fitting.
- RED connector (2) is connected to the A/C high side fitting.



A/C System Evacuation

CAUTION:

Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

NOTE :

Special effort must be used to prevent moisture from entering the A/C system oil. Moisture in the oil is very difficult to remove and will cause a reliability problem with the A/C compressor.

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be filled. Moisture and air mixed with the refrigerant will raise the compressor high pressure above acceptable operating levels. This will reduce the performance of the A/C system and damage the A/C compressor. Moisture will boil at near room temperature when exposed to vacuum.

NOTE :

When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.

To evacuate the refrigerant system:

1. With the engine OFF, connect a suitable charging station, refrigerant recovery machine or a manifold gauge set with vacuum pump and refrigerant recovery equipment. Do not operate the engine with a vacuum on the A/C system.
2. Open the suction and discharge valves and start the vacuum pump. The vacuum pump should run a minimum of 45 minutes prior to charge to eliminate all moisture in system. When the suction gauge reads to the lowest degree of vacuum possible for 30 minutes, close all valves and turn off vacuum pump. If the system fails to reach specified vacuum, the refrigerant system likely has a leak that must be corrected. If the refrigerant system maintains specified vacuum for at least 30 minutes, start the vacuum pump, open the suction and discharge valves. Then allow the system to evacuate an additional 10 minutes.
3. Close all valves.
4. Turn off and disconnect the vacuum pump.
5. Charge the refrigerant system.

A/C System Recharge

After all refrigerant system leaks have been repaired and the refrigerant system has been evacuated, a refrigerant charge can be injected into the system.

CAUTION:

A small amount of refrigerant oil is removed from the A/C system each time the refrigerant system is recovered and evacuated. Before charging the A/C system, you MUST replenish any oil lost during the recovery process.

1. Evacuate the refrigerant system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

2. A manifold gauge set and an R-134a refrigerant recovery/recycling/charging station that meets SAE standard J2210 should be connected to the refrigerant system.
3. Open both the suction and discharge valves, then open the charge valve to allow the refrigerant to flow into the system.
4. When the transfer of refrigerant has stopped, close both the suction and discharge valves.
5. If all of the refrigerant charge did not transfer from the dispensing device, open all of the windows in the vehicle and set the heating-A/C system controls so that the A/C compressor is operating and the blower motor is running at its lowest speed setting. Run the engine at a steady high idle (about 1400 RPM).
6. Open the low-pressure valve to allow the remaining refrigerant to transfer to the refrigerant system.

WARNING!

Take care not to open the discharge (high pressure) valve at this time. Failure to follow this warning could result in possible personal injury or death.

7. Disconnect the refrigerant recovery/recycling station from the refrigerant system service ports.
8. Reinstall the caps onto the refrigerant system service ports.

A/C Compressor

Description

The A/C system uses a SD7V16 clutch-less compressor. The compressor is a variable displacement compressor. The largest displacement is 161.3 ml/r, displacement range of 5% to 100%.

CAUTION:

Do not run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

NOTE :

The compressor drive hub and the pulley and bearing assembly cannot be serviced separately from the A/C compressor. In the event of drive hub or pulley and bearing assembly damage or failure, the A/C compressor, drive hub and pulley and bearing must be replaced as an assembly.

Operation

The A/C compressor is controlled by the Engine Control Module (ECM), depending on engine application. The ECM calculates compressor displacement required by A/C system load and demand by monitoring vehicle speed, A/C high side pressure, engine speed, evaporator temperature, accelerator pedal position, ambient temperature and A/C-heater request signals. The ECM then sends a pulse width modulated signal to the A/C compressor control solenoid to increase or decrease refrigerant flow through an orifice located within the compressor housing. The amount of refrigerant allowed to pass through the orifice in the compressor determines the head pressure which controls the angle of the swash plate, which in turn, determines the amount of compressor displacement. When there is no demand for A/C, the swashplate is adjusted to nearly a zero degree angle, which removes compressor torque drag from the engine.

NOTE :

The A/C compressor cannot be repaired and it must be replaced if found inoperative or damaged. If an internal failure of the A/C compressor has occurred, the A/C accumulator and the A/C liquid line must also be replaced.

Removal & Installation

WARNING!

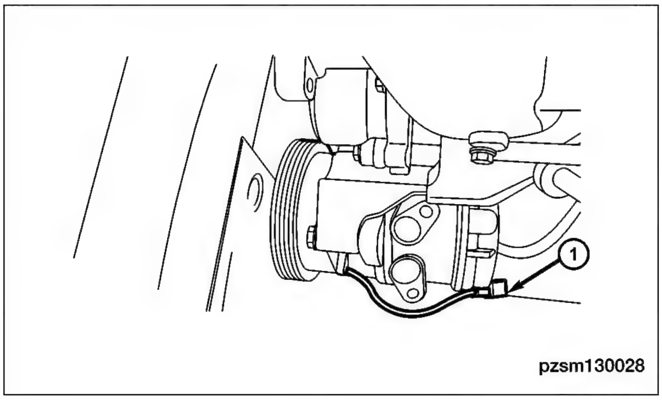
Review safety precautions and warnings in this group before performing this procedure. Failure to follow the warnings and cautions could result in possible personal injury or death.

CAUTION:
The A/C accumulator and the A/C liquid line must be replaced if an internal failure of the A/C compressor has occurred. Failure to replace the A/C accumulator and the A/C liquid line can cause serious damage to the replacement A/C compressor.

NOTE :
When replacing multiple A/C system components, determine how much oil should be removed from the new A/C compressor.

NOTE :
Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is opened. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.

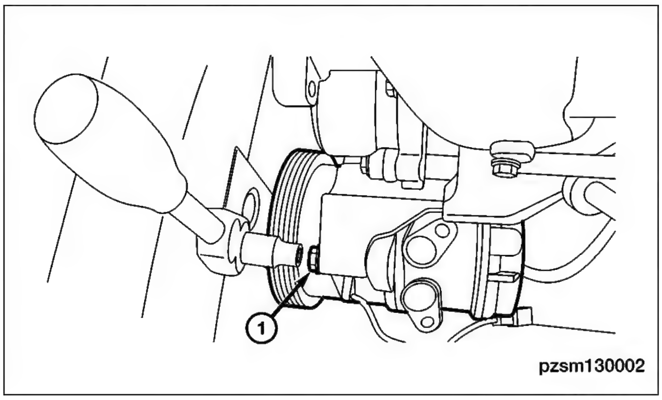
1. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).
2. Remove the power steering pump (See Power Steering Pump Removal & Installation in Section 11 Steering).
3. Disconnect the A/C compressor electrical connector (1).



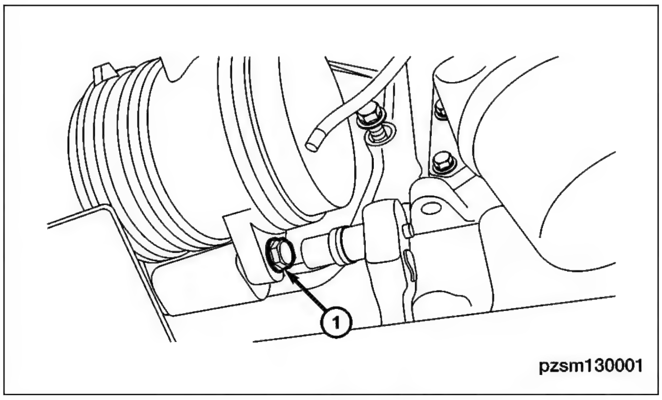
4. Remove the engine drive belt (See Drive Belt Removal & Installation in Section 02 Engine).
5. Remove the A/C compressor pressure line bolts connected to the A/C compressor.
   (Tighten: A/C compressor pressure line bolts to 20 N·m)

NOTE :
After removing the A/C lines, plug the A/C lines to prevent any debris from entering the A/C system.

6. Remove the A/C compressor upper mounting bolt (1).
   (Tighten: A/C compressor upper mounting bolt to 20 + 5 N·m)



7. Raise and support the vehicle.
8. Remove the A/C compressor lower mounting bolt (1).
   (Tighten: A/C compressor lower mounting bolt to 20 + 5 N·m)
9. Carefully remove the A/C compressor.
10. Installation is in the reverse order of removal.



Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).

Evaporator

Description

The evaporator coil is located in the HVAC housing, under the instrument panel. The evaporator coil is positioned in the HVAC housing so that all air that enters the housing must pass over the fins of the evaporator before it is distributed through the system ducts and outlets. However, air passing over the evaporator coil fins will only be conditioned when the compressor is engaged and circulating refrigerant through the evaporator coil tubes.

Operation

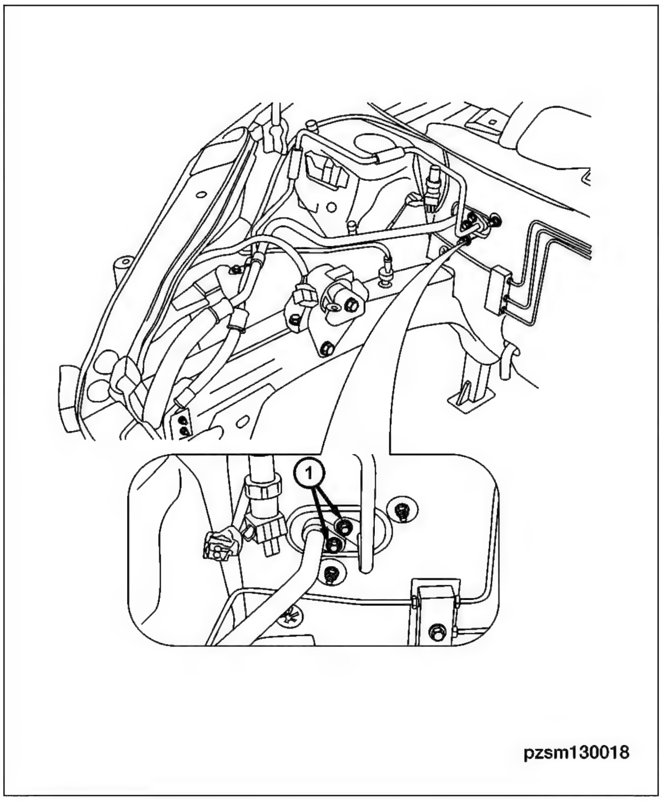
Refrigerant enters the evaporator from the orifice tube as a low-temperature, low-pressure liquid. As air flows over the fins of the evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas before it leaves the evaporator. The evaporator core housing directs airflow from the blower motor through the evaporator core and heater core. All airflow from the blower motor passes through the evaporator core. The airflow is then directed through or around the heater core by the temperature blend door(s). An electric actuator-positioned temperature blend door to direct airflow through or around the heater core.

Removal & Installation

1. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).

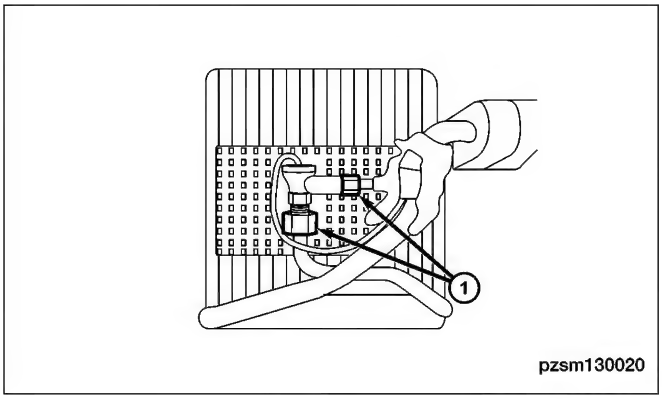
2. Remove the A/C high pressure and low pressure line retaining nuts (1) from the evaporator.

NOTE :
After removing the A/C lines, plug the A/C lines to prevent any debris from entering the A/C system.



3. Remove the HVAC housing (See HVAC Housing Removal & Installation in Section 13 Heating & Air Conditioning).
4. Remove the recirculation door actuator (See Recirculation Door Actuator Removal & Installation in Section 13 Heating & Air Conditioning).
5. Remove the nine screws on the evaporator shield, and pry the two clips off to remove the evaporator shield.

   NOTE: The sponge seal around the housing must be replaced when servicing the evaporator. The seal is not reusable.
6. Remove the evaporator assembly.
7. Remove the expansion valve connecting nuts (1).



8. Remove the expansion valve.
9. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).

Condenser

Description

The condenser is located in the air flow in front of the engine cooling radiator. The condenser transforms the refrigerant from gaseous into liquid. It is attached to the vehicle with bolts and the A/C lines with fittings.

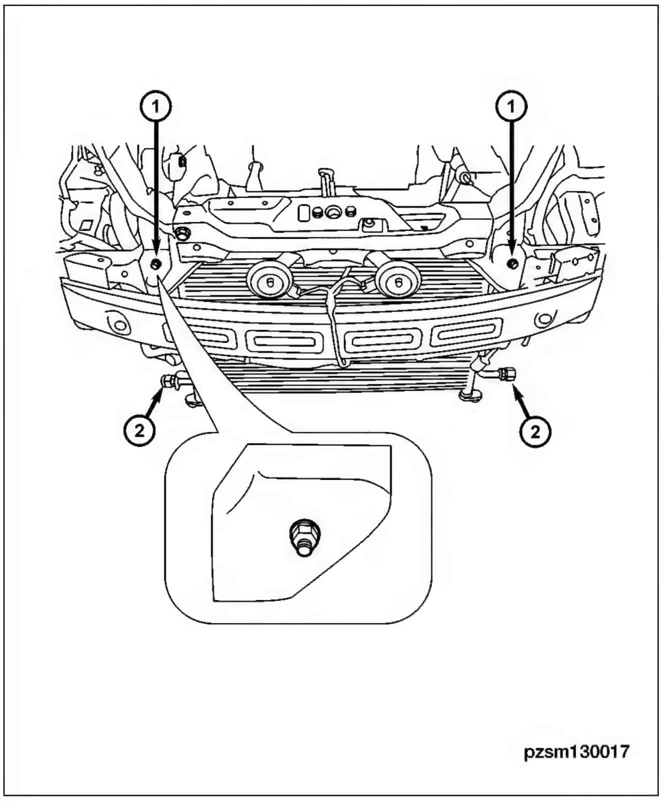
Operation

When the refrigerant gas gives up its heat, it condenses. When the refrigerant leaves the condenser, it becomes a high-pressure liquid refrigerant. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the air conditioning system. Therefore, it is important that there are no objects placed in front of the radiator grille openings in the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow. Also, any factory-installed air seals or shrouds must be properly reinstalled following radiator or condenser service.

Removal & Installation

1. Disconnect the negative battery cable.
2. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).
3. Remove the front bumper (See Front Bumper Removal & Installation in Section 15 Body).
4. Remove the cooling fan (See Cooling Fan Removal & Installation in Section 06 Cooling).
5. Remove the radiator (See Radiator Removal & Installation in Section 06 Cooling).
6. Remove the A/C pressure lines (2) connected to the left and right side of the A/C condenser. Remove and discard the O-ring seal and gasket.

   NOTE: After removing the A/C lines, plug the A/C lines to prevent any debris from entering the A/C system.
7. Remove the two condenser mounting nuts (1). (Tighten: Condenser mounting nuts to 6 N·m)



8. Remove the condenser from the engine compartment.
9. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).

Accumulator

Description

The accumulator is connected directly to the evaporator outlet and stores excess liquid refrigerant. Accumulators are used on systems that use an orifice tube to meter refrigerants into the evaporator.

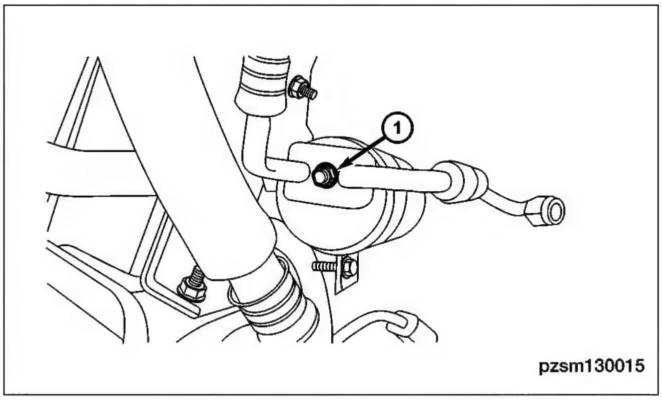
Operation

The primary function of the accumulator is to isolate the compressor from any damaging liquid refrigerant. The accumulator removes debris and moisture from the air conditioning system.

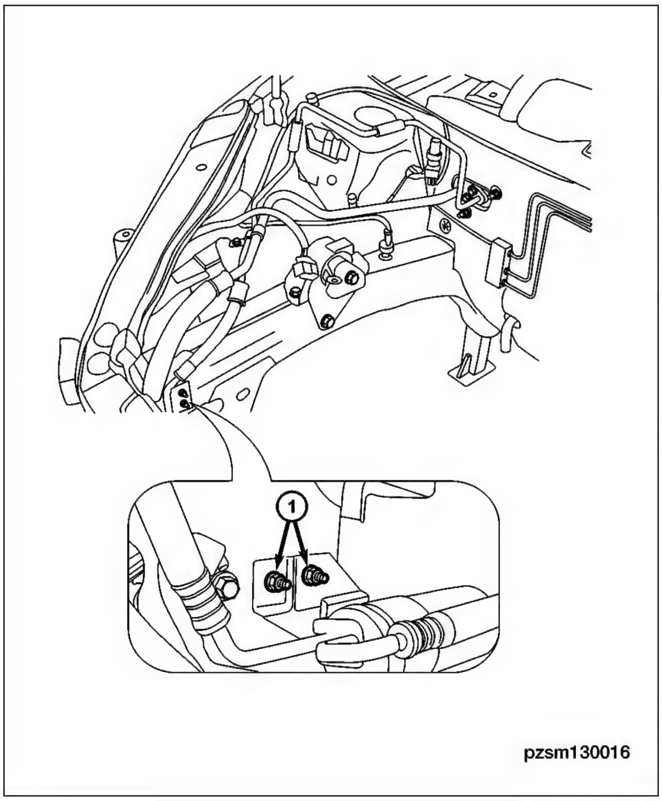
Removal & Installation

1. Disconnect the negative battery cable.
2. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).
3. Remove the retaining nut (1) on the accumulator and remove the A/C pressure lines.

   NOTE: After removing the A/C lines, plug the A/C lines to prevent any debris from entering the A/C system.
4. Remove and discard the O-ring seals and gaskets.



5. Remove the accumulator mounting bolts (1).



6. Remove the accumulator.
7. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).

Liquid Line

Description

The A/C liquid line connects the A/C condenser to the A/C evaporator.

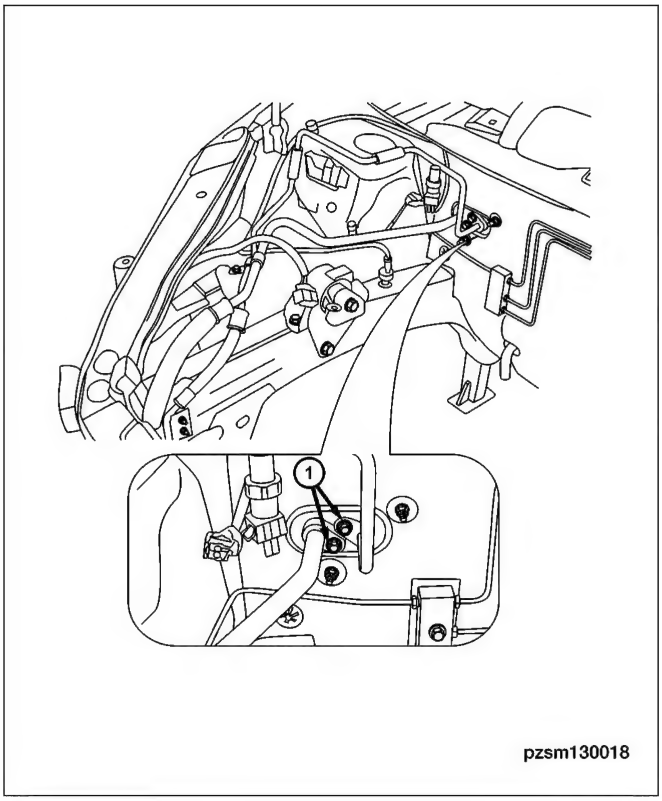
Operation

The high pressure A/C liquid line is the refrigerant line that carries refrigerant from the A/C condenser to the A/C accumulator. Air conditioning hoses are designed to control liquid and gas at high pressures and temperatures. The hoses are usually flexible and equipped with special metal fittings at the ends to prevent leaks and provide a sure seal and connection between components.

Removal & Installation

1. Disconnect the negative battery cable.
2. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).
3. Remove the A/C accumulator (See Accumulator Removal & Installation in Section 13 Heating & Air Conditioning).

4. Remove the nuts (1) that secure the A/C pressure line assembly to the A/C evaporator.



5. Remove the A/C pressure line clamp retaining bolt from the engine body.
6. Disconnect the A/C liquid line assembly from the A/C condenser.
7. Remove and discard the dual-plane seals.
8. Plug the opened refrigerant line fittings and the evaporator ports to keep debris out of the refrigerant system.
9. Remove the A/C liquid line assembly from the engine compartment.
10. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).

Suction Line

Description

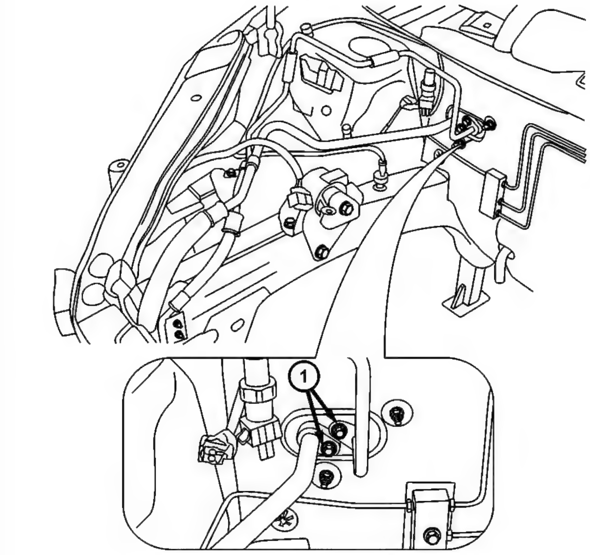
The A/C suction line connects the A/C evaporator to the A/C compressor and from A/C compressor to the A/C condenser.

Operation

The low pressure A/C suction line is the refrigerant line that carries refrigerant from the A/C evaporator to the A/C condenser. Air conditioning hoses are designed to control liquid and gas at high pressures and temperatures. The hoses are usually flexible and equipped with special metal fittings at the ends to prevent leaks and provide a sure seal and connection between components.

Removal & Installation

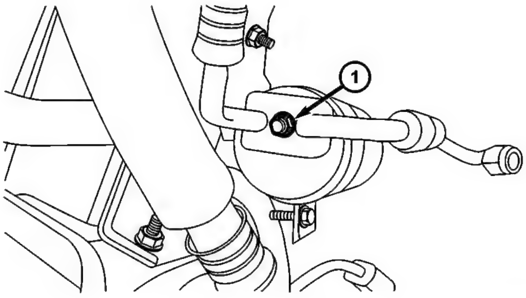
1. Disconnect the negative battery cable.
2. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).
3. Remove the nuts (1) that secure the A/C pressure line assembly to the A/C evaporator.



pzsm130018

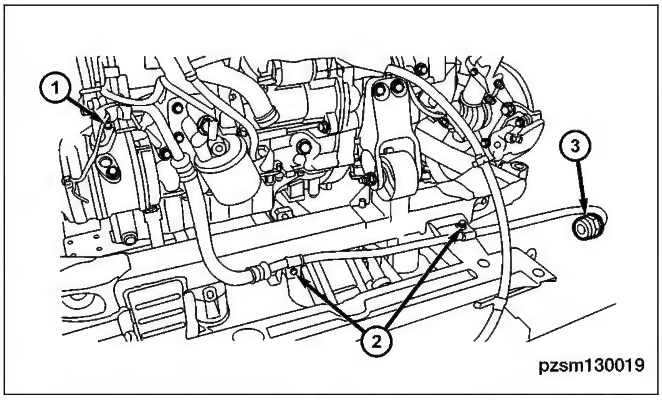
4. Remove the A/C pressure line clamp retaining bolt from the engine body.
5. Disconnect the A/C pressure switch.
6. Remove the retaining nut (1) on the accumulator and remove the A/C pressure lines.

   NOTE: After removing the A/C lines, plug the A/C lines to prevent any debris from entering the A/C system.



pzsm130015

7. Remove the retaining bolt (1) connecting the A/C suction line to the compressor.
8. Loosen the retaining nut (3) connecting the A/C suction line to the condenser.
9. Remove the two A/C suction line retaining bolts (2) from the clamps.



10. Plug or tape over the opened refrigerant line fittings and the evaporator ports.
11. Remove the A/C suction line assembly from the engine compartment.
12. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating and Air Conditioning).

Heater Core

Description

The heater core is located in the HVAC housing. The heater core is a heat exchanger made of rows of tubes with fins and is positioned within the air distribution housing so that only the selected amount of air entering the housing passes through the heater core before it is distributed through the heating-A/C system ducts and outlets. One end of the heater core is fitted with a tank that includes the fittings for the heater core tubes. The heater core can only be serviced by removing the HVAC housing from the vehicle.

Operation

Engine coolant is circulated through the heater hoses to the heater core at all times. As the coolant flows through the heater core, heat is removed from the engine and is transferred to the heater core tubes and fins. Air directed through the heater core picks up the heat from the heater core fins. The blend-air door allows control of the heater output air temperature by regulating the amount of air flowing through the heater core. The blower motor speed controls the volume of air flowing through the HVAC housing.

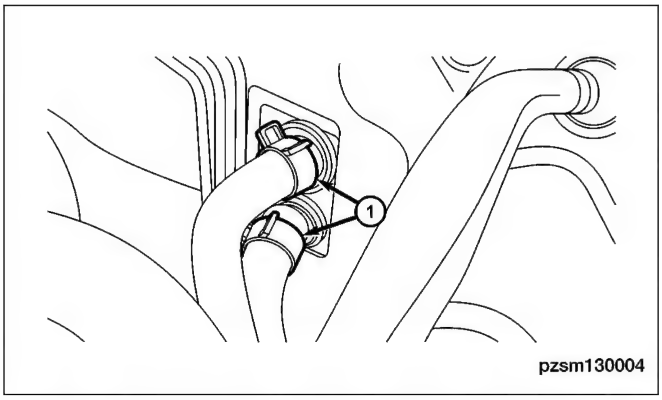
Removal & Installation

WARNING!

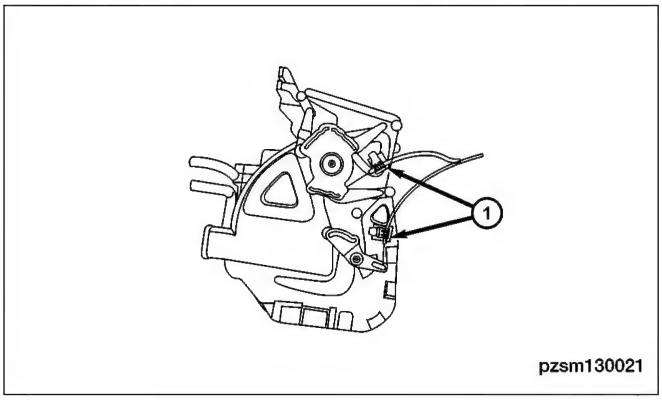
Always allow the engine to cool before opening the cooling system. Do not loosen the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

1. Drain the cooling system (See Cooling System Draining Procedure in Section 06 Cooling System).

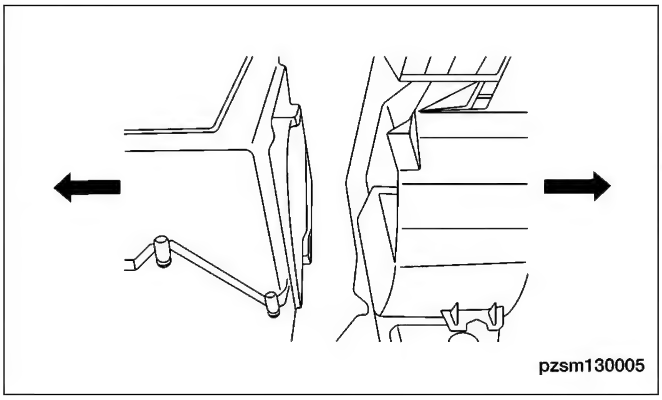
2. Disconnect the heater core hoses (1).



3. Remove the instrument panel (See Instrument Panel Removal & Installation in Section 15 Body & Accessories).
4. Disconnect the HVAC housing electrical connector.
5. Remove the HVAC housing assembly and place it on a workbench (See HVAC housing removal & installation in Section 13 Heating & Air Conditioning).
6. Remove the mode door and the blend door cable retaining clamps (1) and remove the two cables.



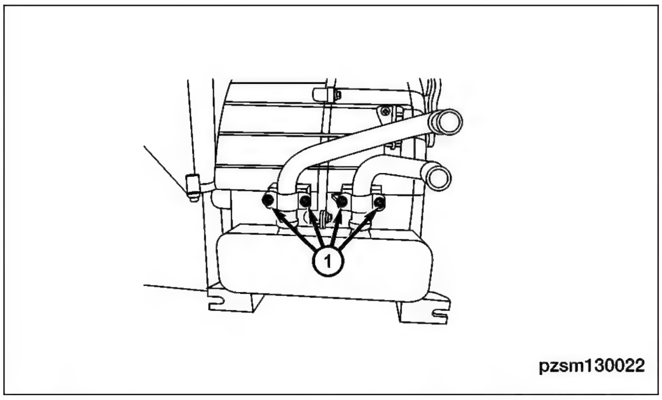
7. Loosen the two heat exchanger shield retaining screws and remove the heat exchanger shield.



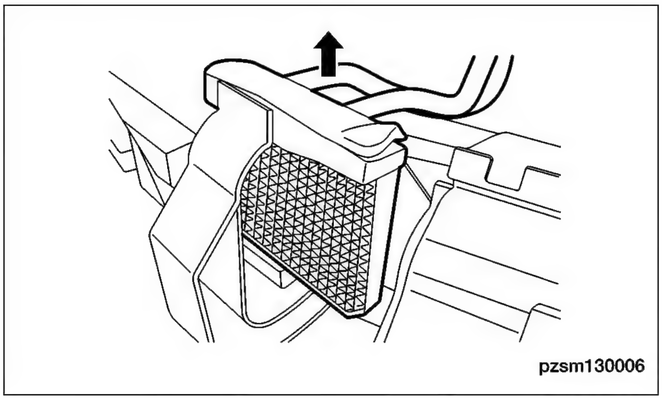
8. Remove the eight screws on the heater shield, and disassemble the evaporator shield.

9. Tear open the sponge seal around the inlet/outlet coolant pipes and remove the retaining screws (1).

   NOTE: The sponge seal around the heater shield must be replaced when servicing the heater core. The seal is not reusable.



10. Pry the clips off and remove the air conditioner cover plate assembly.



11. Remove the heater core.
12. Installation is in the reverse order of removal.

Installation Notes:

- Verify the cooling system is filled to proper specifications.

RESTRAINTS

14

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AIRBAG SYSTEM

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GENERAL INFORMATION

Description

Available occupant restraints for this vehicle include both active and passive types. Active restraints are those which require the vehicle occupants to take some action to employ, such as fastening a seat belt; while passive restraints require no action by the vehicle occupants to be employed.

Active Restraints

- Front Seat Belts
- Rear Seat Belts

Passive Restraints

- Driver Airbag
- Passenger Airbag
- Seat Belt Tensioner

Operation

Active Restraints

The primary passenger restraints are the seat belts. Seat belts are referred to as an active restraint because the vehicle occupants are required to physically fasten and properly adjust these restraints in order to benefit from them.

Passive Restraints

The passive restraints are referred to as a supplemental restraint system because they were designed and are intended to enhance the protection for the occupants of the vehicle only when used in conjunction with the seat belts. They are referred to as passive restraints because the vehicle occupants are not required to do anything to make them operate; however, the vehicle occupants must be wearing their seat belts in order to obtain the maximum safety benefit from the supplemental restraint system.

The supplemental restraint system electrical circuits are continuously monitored and controlled by a microprocessor and software contained within the Restraints Control Module (RCM). An airbag indicator in the Instrument Cluster illuminates for about seven seconds as a bulb test each time the ignition switch is turned to the ON or START positions. Following the bulb test, the airbag indicator is turned ON or OFF by the RCM to indicate the status of the supplemental restraint system. If the airbag indicator comes ON at any time other than during the bulb test, it indicates that there is a problem in the supplemental restraint system electrical circuits. Such a problem may cause airbags not to deploy when required, or to deploy when not required.

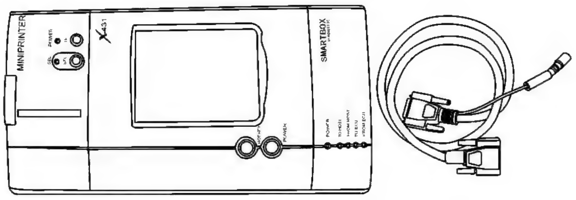
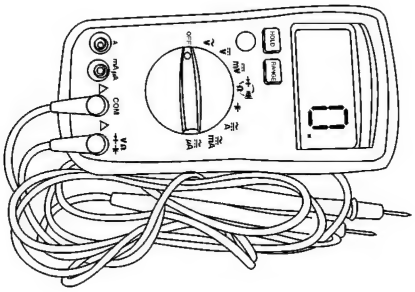
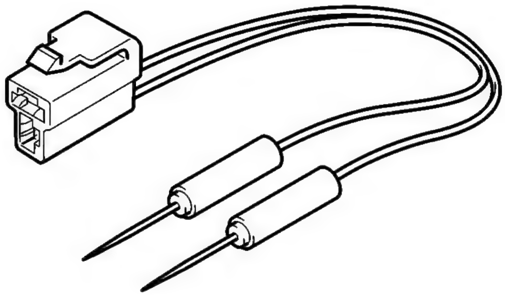
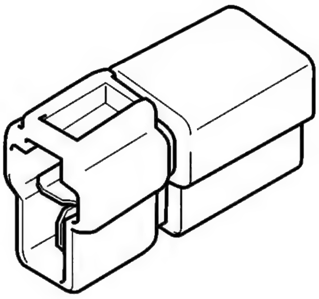
Deployment of the supplemental restraints depends upon the angle and severity of an impact. When an impact is severe enough, the microprocessor in the RCM signals the inflator of the appropriate airbag units to deploy their airbag cushions. The front seat belt tensioners are provided with a deployment signal by the RCM in conjunction with the front airbags.

Specifications

Torque Specifications

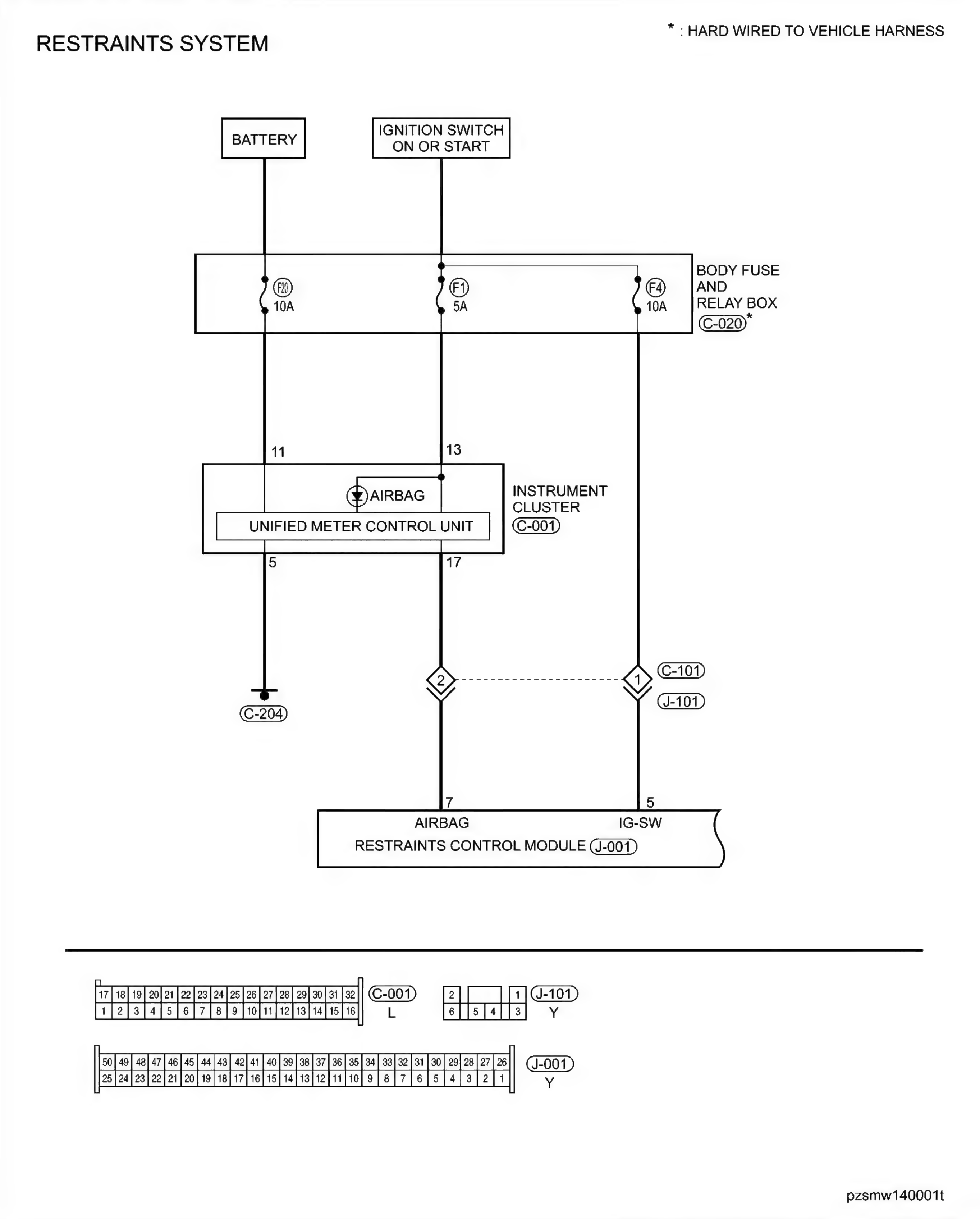
DESCRIPTION	TORQUE (N·m)
Driver Side Airbag Mounting Bolt	10
Restraints Control Module Mounting Nut	10
Front Passenger Side Airbag Mounting Bolt	10

Special Tools

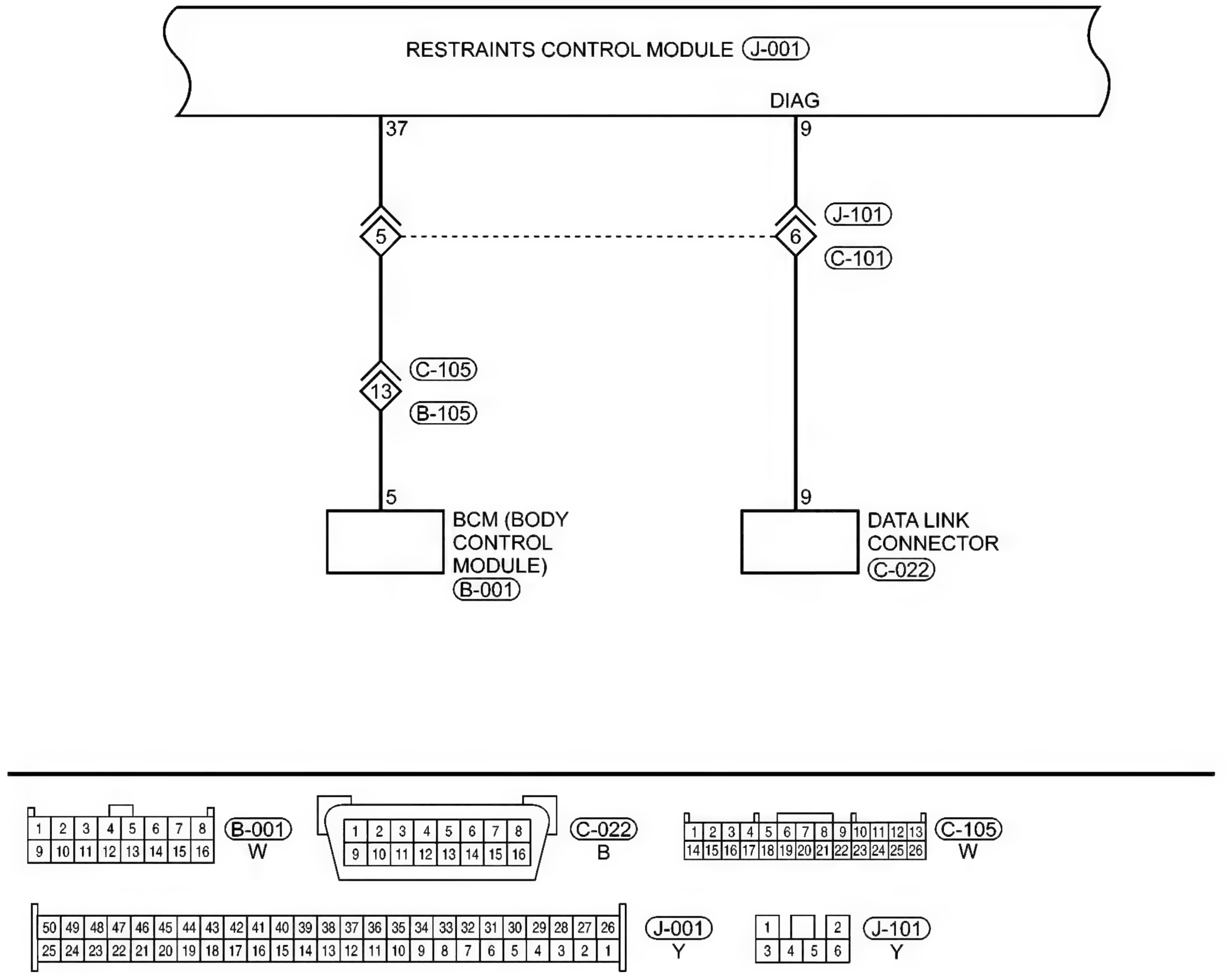
Diagnostic Scan Tool X-431	 besm030001
Digital Multimeter Fluke 15B & 17B	 besm030002
General Airbag Special Load Tool - Resistor Harness (For Driver's and Passenger's (Front) Airbag)	 ltsmd140011
General Airbag Special Load Tool - Dummy Resistor(For Driver's and Passenger's (Front) Airbag and Seat Belt Pre-Tensioner Circuit Check)	 ltsmd140010

Electrical Schematics

Airbag Control System (Page 1 of 3)

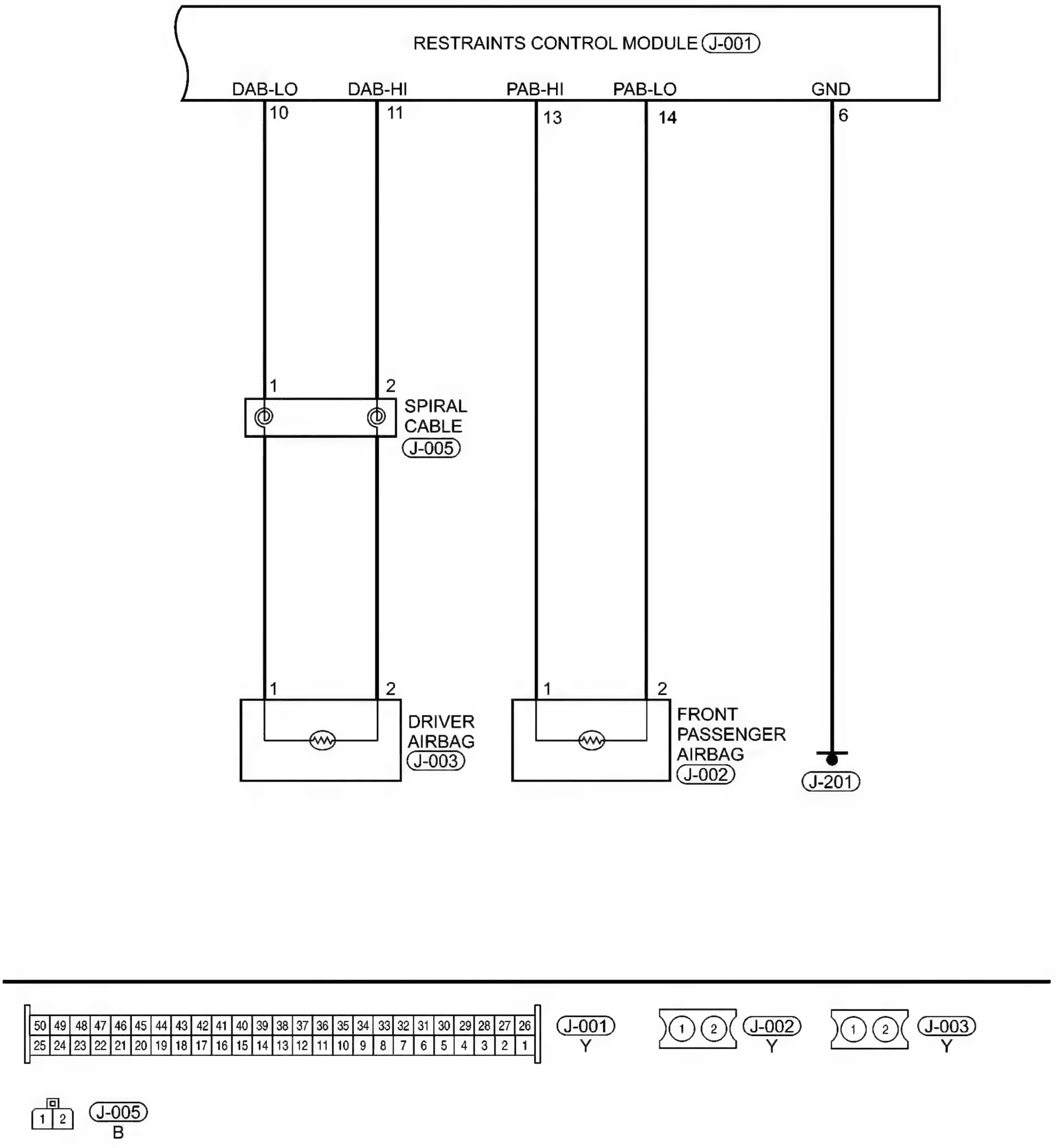

RESTRAINTS SYSTEM
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
F20 10A
F1 5A
F4 10A
BODY FUSE AND RELAY BOX C-020*
11
13
AIRBAG
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER C-001
5
17
C-204
2
1
C-101
J-101
7
5
AIRBAG
IG-SW
RESTRAINTS CONTROL MODULE J-001
C-001 L
J-101 Y
J-001 Y
pzsmw140001t

Airbag Control System (Page 2 of 3)


RESTRAINTS CONTROL MODULE J-001
DIAG
37
9
5
6
J-101
C-101
C-105
13
B-105
5
9
BCM (BODY CONTROL MODULE) B-001
DATA LINK CONNECTOR C-022
B-001
W
C-022
B
C-105
W
J-001
Y
J-101
Y

pzsmw140003t

Airbag Control System (Page 3 of 3)


RESTRAINTS CONTROL MODULE J-001
DAB-LO
DAB-HI
PAB-HI
PAB-LO
GND
10
11
13
14
6
1
2
SPIRAL CABLE J-005
1
2
DRIVER AIRBAG J-003
1
2
FRONT PASSENGER AIRBAG J-002
J-201
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
J-001 Y
1 2
J-002 Y
1 2
J-003 Y
1 2
J-005 B

pzsmw140002t

Restraints Control Module (RCM) Connector Pin-Out Table

PIN	CIRCUIT IDENTIFICATION	PIN	CIRCUIT IDENTIFICATION
1	Driver Seat Belt Pretensioner Lo	26	-
2	Driver Seat Belt Pretensioner Hi	27	-
3	Front Passenger Seat Belt Pretensioner Lo	28	-
4	Front Passenger Seat Belt Pretensioner Hi	29	-
5	Ignition-Switch	30	-
6	GND	31	-
7	Airbag Lamp	32	-
8	-	33	-
9	Diagnostic Link K	34	-
10	Driver Airbag Lo	35	-
11	Driver Airbag Hi	36	-
12	-	37	To BCM
13	Front Passenger Airbag Hi	38	-
14	Front Passenger Airbag Lo	39	-
15	-	40	-
16	-	41	-
17	-	42	-
18	-	43	-
19	-	44	-
20	-	45	-
21	-	46	-
22	-	47	-
23	-	48	-
24	-	49	-
25	-	50	-

DIAGNOSIS & TESTING

Diagnostic Help

1. The X-431 scan tool connects to the Data Link Connector (DLC) and communicates with the vehicle electronic modules through the data network.
2. Confirm that the malfunction is current and carry-out the diagnostic tests and repair procedures.
3. If the Diagnostic Trouble Code (DTC) cannot be deleted, it is a current fault.
4. Use a digital multimeter to perform voltage readings on electronic systems.
5. Refer to any Technical Bulletins that may apply to the failure.
6. Visually inspect the related wiring harness.
7. Inspect and clean all Restraints Control Module (RCM) grounds that are related to the most current DTC.
8. If numerous trouble codes were set, use a wiring schematic and look for any common ground circuits or voltage supply circuits that may apply to the DTC.

Intermittent DTC Troubleshooting

If the failure is intermittent, perform the following:

- Check for loose connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Monitor the scan tool data relative to this circuit.
- Wiggle the related wiring harness and connectors while looking for an interrupted signal on the affected circuit.
- If possible, try to duplicate the conditions under which the DTC set.
- Look for the data to change or for the DTC to reset during the wiggle test.
- Look for broken, bent, pushed out or corroded terminals.
- Inspect the sensor and mounting area for any condition that would result in an incorrect signal, such as damage, or foreign material.
- A data recorder, and/or oscilloscope should be used to help diagnose intermittent conditions.
- Remove the Restraints Control Module (RCM) from the troubled vehicle and install in a new vehicle and test. If the DTC cannot be deleted, the RCM is malfunctioning. If the DTC can be deleted, return the RCM to the original vehicle.

Ground Inspection

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This added resistance can alter the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can affect the circuit. Perform the following when inspecting a ground connection:

1. Remove the ground bolt or screw.
2. Inspect all mating surface for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for ″add-on″ accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are crimped to one eyelet, make sure no excess wire insulation has been crimped creating a bad ground.

Diagnostic Tools

Diagnostic Scan Tool X-431

Read the following when connecting the X-431 scan tool:

- Connect the scan tool to the Data Link Connector (DLC) for communication with the vehicle.
- The DLC is located on the driver side compartment under the steering column (it is attached to the instrument panel and accessible from the driver seat).
- The DLC is rectangular in design and capable of accommodating up to 16 terminals.
- The electrical connector has keying features to allow easy connection.

Airbag Special Load Tool

Use the airbag special load tool to diagnose airbag system faults:
- The airbag special load tool simulates airbag system components.

NOTE :
Using the airbag special load tool will help prevent other airbag DTCs from being set while troubleshooting the system.

Digital Multimeter

Read the following when using the digital multimeter:
- Use a multimeter to troubleshoot electrical problems and wiring systems.
- Use a multimeter for basic fault finding and bench testing.
- Use a multimeter to measure voltage, current and resistance.

Diagnostic Trouble Code (DTC) List

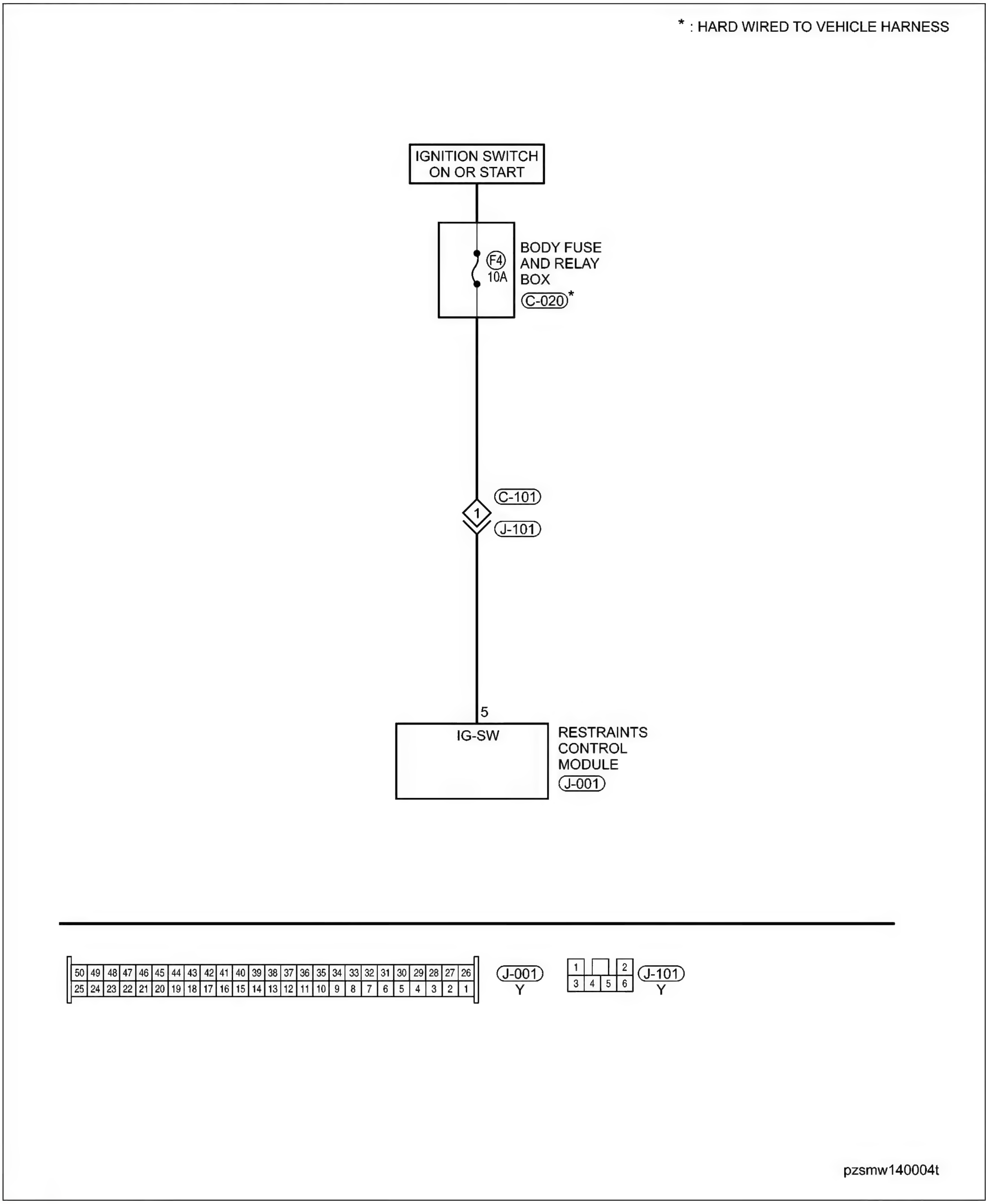
Restraints Control Module DTC List

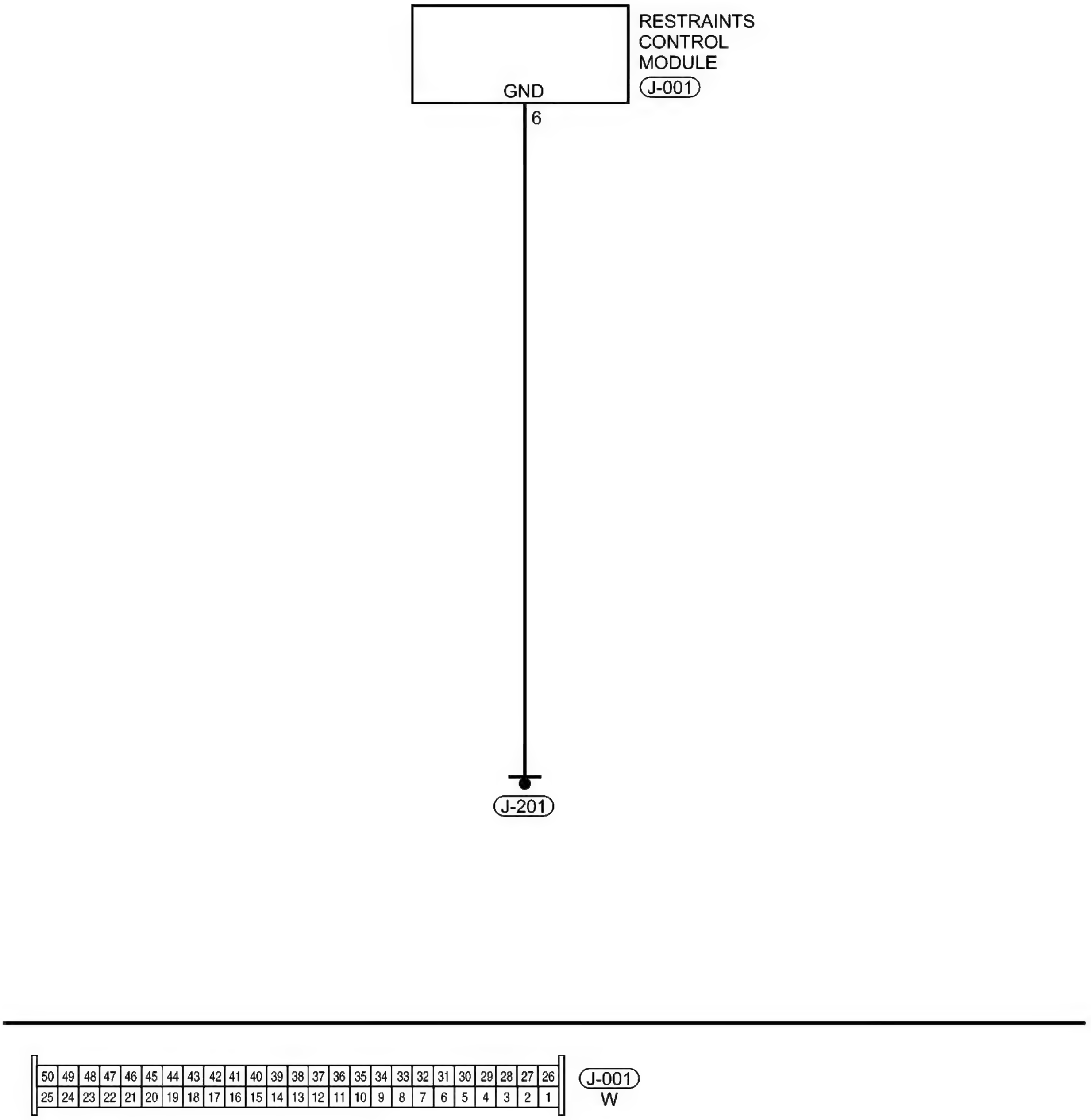
DTC	DTC DEFINITION
B1200	ECU Internal Errors
B1400	Power Supply Under Volt
B1401	Power Supply Over Volt
B1238	Front Driver Airbag I° STAGE Short To GND
B1239	Front Driver Airbag I° STAGE Short To Vbatt
B1240	Front Driver Airbag I° STAGE Short Circuit Or Below Lower Limit Or Ground Lost
B1241	Front Driver Airbag I° STAGE Open Circuit Or Over Upper Limit Or Vbatt Voltage Lost
B1242	Front Passenger Airbag I° STAGE Short To GND
B1243	Front Passenger Airbag I° STAGE Short To Vbatt
B1244	Front Passenger Airbag I° STAGE Short Circuit Or Below Lower Limit Or Ground Lost
B1245	Front Passenger Airbag I° STAGE Open Circuit or Over upper limit Or Vbatt voltage lost
B1254	Front Driver Pretensioner Short To GND
B1255	Front Driver Pretensioner Short To Vbatt
B1256	Front Driver Pretensioner Short Circuit Or Below Lower Limit Or Ground Lost
B1257	Front Driver Pretensioner Open Circuit or Over Upper Limit Or Vbatt Voltage Lost
B1258	Front Passenger Pretensioner Short To GND
B1259	Front Passenger Pretensioner Short To Vbatt
B1260	Front Passenger Pretensioner Short Circuit Or Below Lower Limit Or Ground Lost
B1261	Front Passenger Pretensioner Open Circuit Or Over Upper Limit Or Vbatt Voltage Lost
B1237	Front Passenger Airbag Disable Switch Defective Signal
B1262	Front Driver Sidebag Short To GND
B1263	Front Driver Sidebag Short To Vbatt
B1264	Front Driver Sidebag Short Circuit Or Below Lower Limit Or Ground Lost
B1265	Front Driver Sidebag Open Circuit Or Over Upper Limit Or Vbatt Voltage Lost
B1266	Front Passenger Sidebag Short To GND
B1267	Front Passenger Sidebag Short To Vbatt
B1268	Front Passenger Sidebag Short Circuit Or Below Lower Limit Or Ground Lost
B1269	Front Passenger Sidebag Open Circuit Or Over Upper Limit Or Vbatt Voltage Lost

DTC	DTC DEFINITION
B1270	Front Driver Headbag Short To GND
B1271	Front Driver Headbag Short To Vbatt
B1272	Front Driver Headbag Short Circuit Or Below Lower Limit Or Ground Lost
B1273	Front Driver Headbag Open Circuit Or Over Upper Limit Or Vbatt Voltage Lost
B1274	Front Passenger Headbag Short To GND
B1275	Front Passenger Headbag Short To Vbatt
B1276	Front Passenger Headbag Short Circuit Or Below Lower Limit Or Ground Lost
B1277	Front Passenger Headbag Open Circuit Or Over Upper Limit Or Vbatt Voltage Lost
B1292	Front Driver Side Impact Sensor Defective Signal
B1293	Front Driver Side Impact Sensor Internal Errors
B1294	Front Passenger Side Impact Sensor Defective Signal
B1295	Front Passenger Side Impact Sensor Internal Errors
B2212	Warning Lamp Short To Battery
B2213	Inhibition Lamp Short To Battery
B2214	Warning Lamp Short To Ground
B2215	Inhibition Lamp Short To Ground

Diagnostic Trouble Code (DTC) Tests

B1200 - ECU Internal Errors


* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
F4
10A
BODY FUSE AND RELAY BOX
C-020*
1
C-101
J-101
5
IG-SW
RESTRAINTS CONTROL MODULE
J-001
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
J-001
Y
1 2
3 4 5 6
J-101
Y
pzsmw140004t


RESTRAINTS
CONTROL
MODULE
J-001
GND
6
J-201
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
J-001
W

pzsmw140005t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B1200	ECU internal errors	Ignition switch: ON	Restraints Control Module (RCM) detected an internal failure.	RCM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the Restraints Control Module (RCM).
- Turn ignition switch off, and then turn the ignition switch on.
- With the scan tool, select view DTC and data stream in the RCM.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 14 Restraints for more information).

Diagnostic Guide Lines

Observe the following guide lines while diagnosing this DTC:

- Troubleshoot any Engine Control Module (ECM) charging/cranking DTCs before proceeding.
- If the warning lamp goes out immediately after the warning lamp flashed for 6 - 7 seconds, this indicates that the system is OK.
- If the warning lamp is on for 6 - 7 seconds continuously, then goes out, or the warning lamp is on continuously, this indicates that there are history DTCs in the system. Use the Scan Tool to erase the DTCs.
- If any other condition occurs, use the Scan Tool to erase the history DTCs first, then check the warning lamp. If the warning lamp does not go out immediately after the warning lamp flashes for 6 - 7 seconds when using the Scan Tool, erase the history DTCs first.
- In the course of troubleshooting the airbag system, make sure the system power supply is shut off, and wait two minutes for the system capacitor to discharge.
- The squib circuit connectors integrate a ″shorting″ spring (which prevents the airbag from deploying unintentionally due to static electricity by shorting the positive wire to the negative wire in the squib circuit when the connectors are disconnected). Therefore, if the airbag electrical connector or spiral cable electrical connector is damaged or improperly connected, the shorting spring may not be released when the electrical connector is connected.
- The following tools are required to perform the following test:
    - X-431 Scan Tool
    - Airbag Special Load Tool
    - Digital Multimeter

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK DTC

- Perform DTC confirmation procedure.

Is DTC B1200 present?

Yes >> Go to the next step.

No >> The condition that caused this DTC to set is currently not present (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 14 Restraints for more information).

2. CHECK GROUND CONNECTION

- Turn ignition switch off.
- Disconnect the negative battery cable.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 14 Restraints for more information).
- Inspect the ground connection J-201 mounting position (See Vehicle Wiring Harness Layout - Main Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace ground connection.

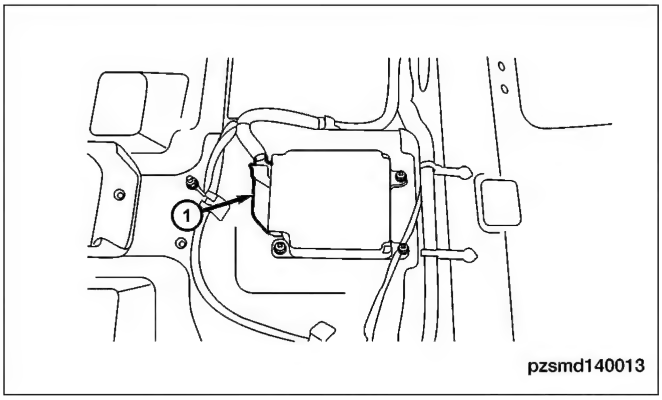
3. CHECK RESTRAINTS CONTROL MODULE (RCM) ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Restraints Control Module (RCM) electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

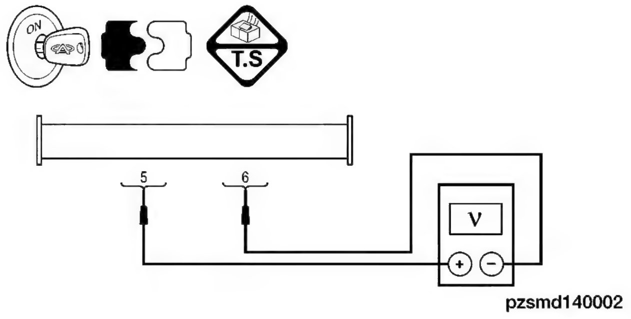
Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



4. CHECK RESTRAINTS CONTROL MODULE (RCM) POWER SUPPLY

- Turn ignition switch on.
- Check voltage between terminal 5 and terminal 6 in the RCM electrical connector J-001 terminal side.

RESTRAINTS CONTROL MODULE (RCM) CONNECTOR TERMINAL	VOLTAGE	
5 & 6	Less than 9 V	

Is the voltage less than 9 V?

Yes >> Go to step 5.

No >> Replace the RCM.

5. CHECK DTC

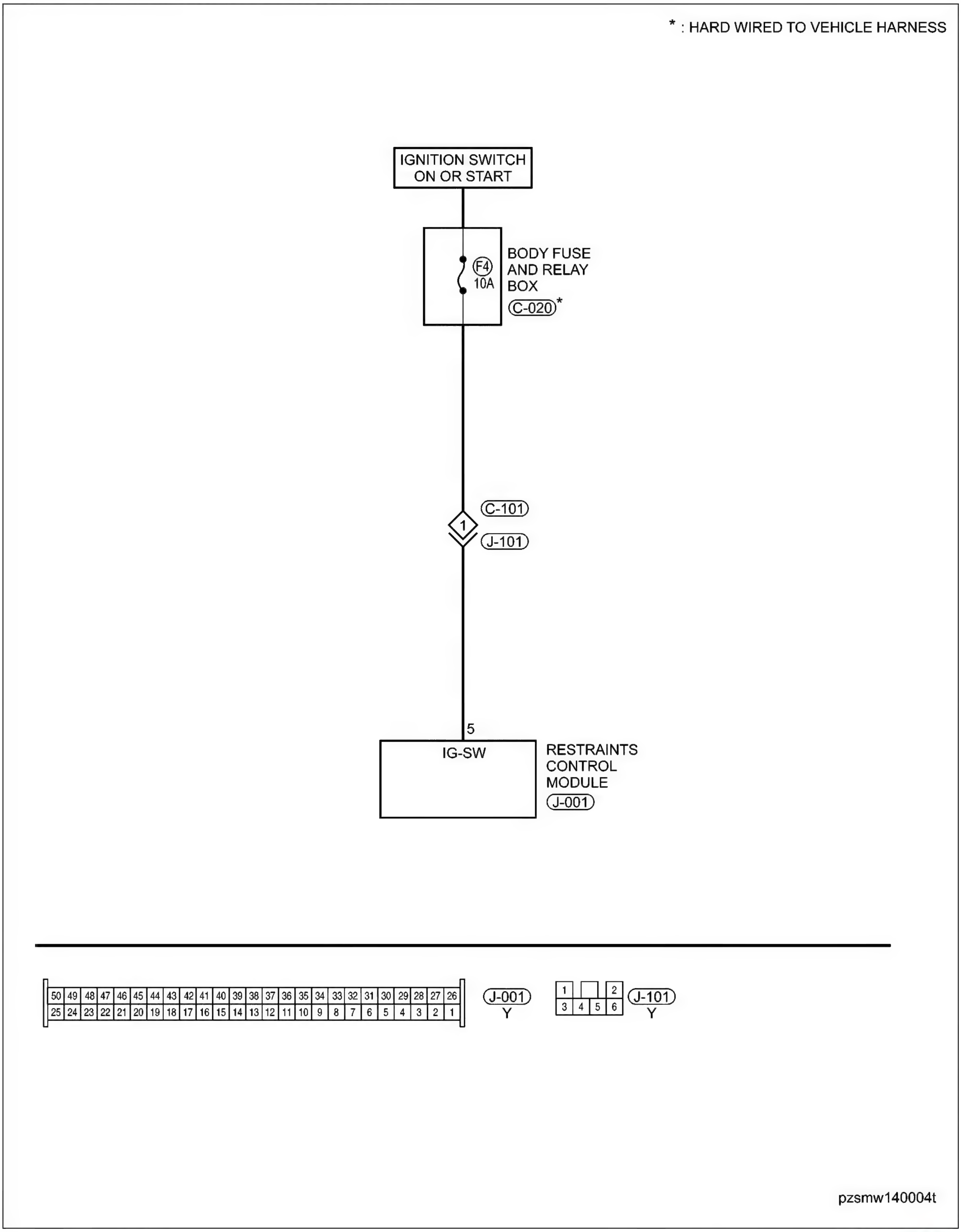
- With the X-431 scan tool, read RCM DTCs.
- Refer to ″DTC Confirmation Procedure″.

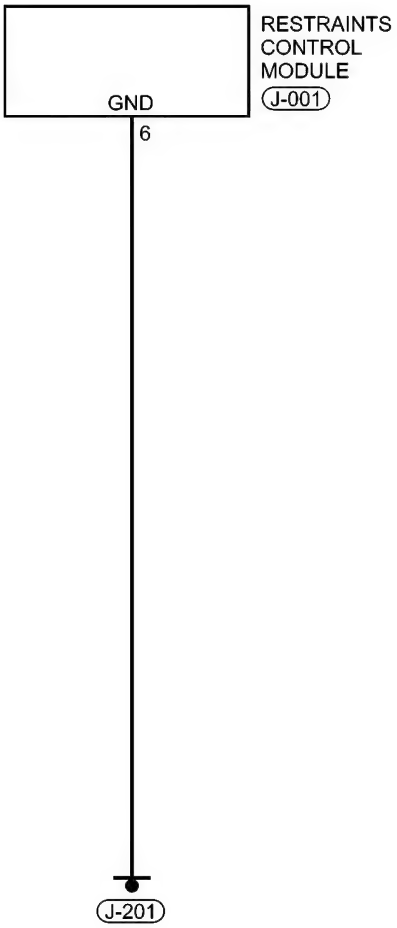
Is DTC B1200 still present?

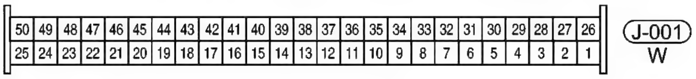
Yes >> Replace the Restraints Control Module (RCM).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

B1400 - Power Supply Under Volt


* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
F4
10A
BODY FUSE AND RELAY BOX
C-020*
1
C-101
J-101
5
IG-SW
RESTRAINTS CONTROL MODULE
J-001
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
J-001
Y
1 2
3 4 5 6
J-101
Y
pzsmw140004t


RESTRAINTS
CONTROL
MODULE
J-001
GND
6
J-201


50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
J-001
W

pzsmw140005t

NOTE :
The Restraints Control Module (RCM) ground pin must be connected to the vehicle chassis in the immediate location of the RCM mounting area.

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B1400	Battery voltage low	Ignition switch: ON	Restraints Control Module (RCM) detected that the battery voltage is excessively low.	• Battery • Charging system • Harness is open or shorted • Restraints Control Module (RCM)

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the Restraints Control Module (RCM).
- Turn ignition switch off, and then turn the ignition switch on.
- With the scan tool, select view DTC and data stream in the RCM.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 14 Restraints for more information).

Diagnostic Guide Lines

Observe the following guide lines while diagnosing this DTC:

- Troubleshoot any Engine Control Module (ECM) charging/cranking DTCs before proceeding.
- If the warning lamp goes out immediately after the warning lamp flashed for 6 - 7 seconds, this indicates that the system is OK.
- If the warning lamp is on for 6 - 7 seconds continuously, then goes out, or the warning lamp is on continuously, this indicates that there are history DTCs in the system. Use the Scan Tool to erase the DTCs.
- If any other condition occurs, use the Scan Tool to erase the history DTCs first, then check the warning lamp. If the warning lamp does not go out immediately after the warning lamp flashes for 6 - 7 seconds when using the Scan Tool, erase the history DTCs first.
- In the course of troubleshooting the airbag system, make sure the system power supply is shut off, and wait two minutes for the system capacitor to discharge.
- The squib circuit connectors integrate a ″shorting″ spring (which prevents the airbag from deploying unintentionally due to static electricity by shorting the positive wire to the negative wire in the squib circuit when the connectors are disconnected). Therefore, if the airbag electrical connector or spiral cable electrical connector is damaged or improperly connected, the shorting spring may not be released when the electrical connector is connected.
- The following tools are required to perform the following test:
  - X-431 Scan Tool
  - Airbag Special Load Tool
  - Digital Multimeter

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Disconnect the negative battery cable.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 14 Restraints for more information).
- Inspect the ground connection J-201 mounting position (See Vehicle Wiring Harness Layout - Main Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace ground connection.

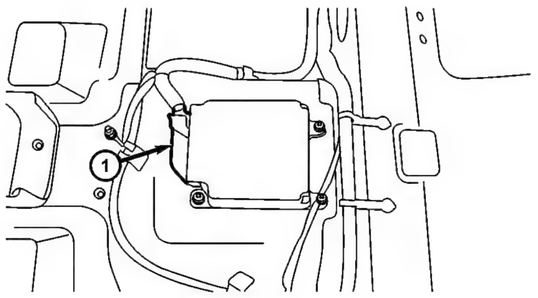
2. CHECK RESTRAINTS CONTROL MODULE (RCM) ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Restraints Control Module (RCM) electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

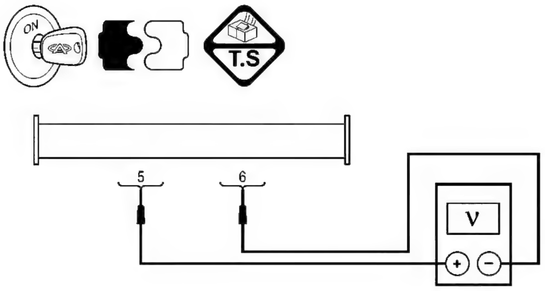
No >> Repair or replace the electrical connector as necessary.



pzsmd140013

3. CHECK RESTRAINTS CONTROL MODULE (RCM) POWER SUPPLY

- Turn ignition switch on
- Check voltage between terminal 5 and terminal 6 in the RCM electrical connector J-001 terminal side.

RESTRAINTS CONTROL MODULE (RCM) CONNECTOR TERMINAL	VOLTAGE	 pzsmd140002
5 & 6	Less than 9 V	

Is the voltage less than 9 V?

Yes >> Go to step 4.

No >> Replace the RCM.

4. CHECK SYSTEM VOLTAGE

- Start the engine, raise the engine speed to above 1000 RPM.
- Measure the charging system voltage at the battery positive and negative terminals.

Is the voltage less than 9 V?

Yes >> Check the charging system.

No >> Go to the next step.

5. CHECK THE BATTERY

- Maintain engine speed above 1000 RPM for a few minutes.
- Turn ignition switch off.
- Measure the voltage drop at the battery positive and negative terminals while cranking the engine.
- Battery voltage should be more than approximately 9.0 V.

Is the check result normal?

Yes >> Go to step 6.

No >> Charge or replace the battery.

6. CHECK RESTRAINTS CONTROL MODULE (RCM) SUPPLY CIRCUIT

- Turn ignition switch off.
- Disconnect the battery positive terminal.
- Measure continuity between the RCM connector terminal 5 and the battery positive terminal.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Check fuse.
Check the electrical harness for an open or high resistance.

7. CHECK DTC

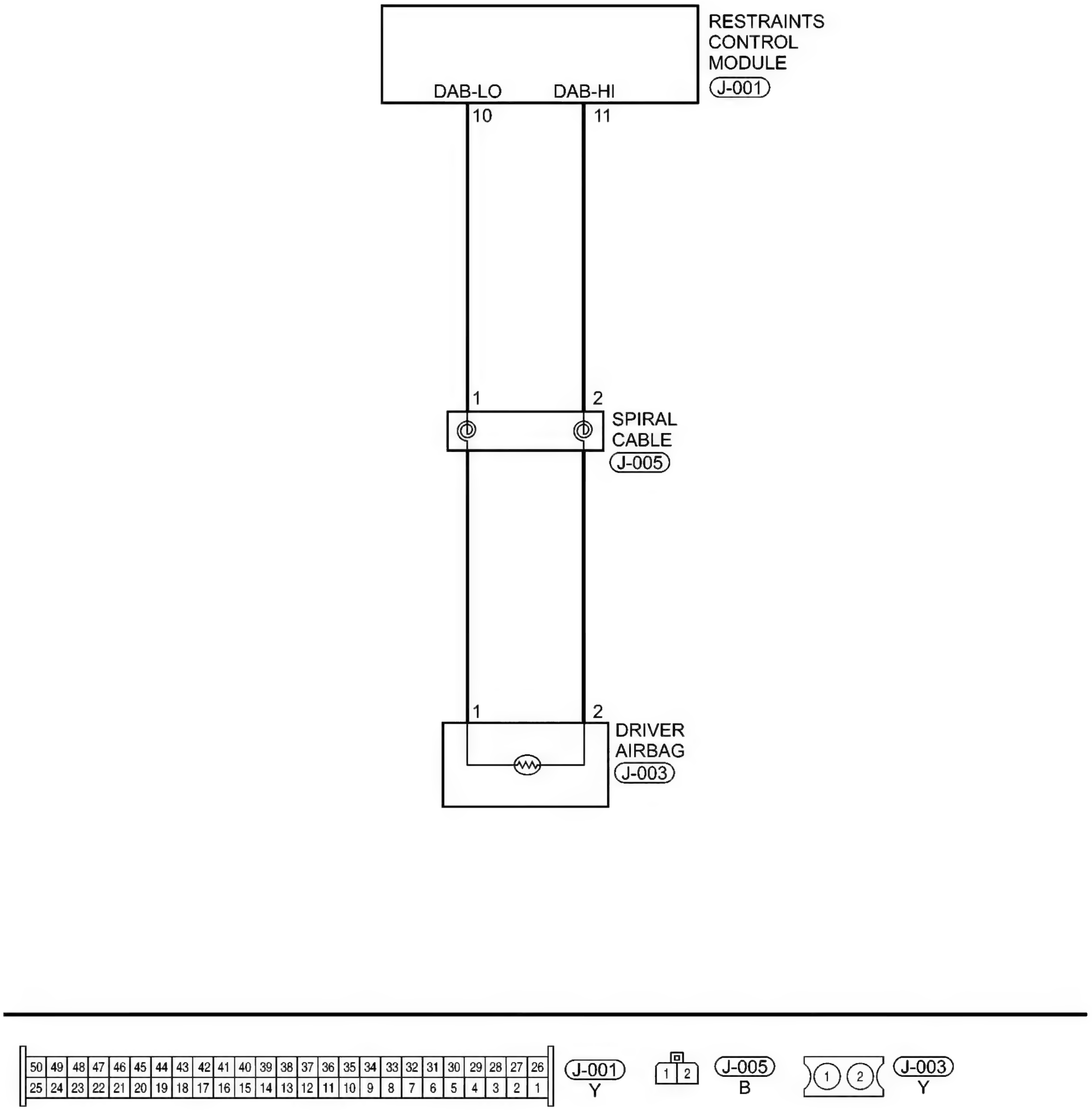
- With the X-431 scan tool, read RCM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC B1400 still present?

Yes >> Replace the RCM.

No >> The system is now operating properly.

B1241 - Front Driver Airbag I °STAGE Open Circuit or Over Upper Limit or Vbatt Voltage Lost


RESTRAINTS
CONTROL
MODULE
J-001
DAB-LO
DAB-HI
10
11
1
2
SPIRAL
CABLE
J-005
1
2
DRIVER
AIRBAG
J-003
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
J-001
Y
1 2
J-005
B
1 2
J-003
Y

pzsmw140008t

NOTE :
The Restraints Control Module (RCM) ground pin must be connected to the vehicle chassis in the immediate location of the RCM mounting area.

WARNING!
After installing the Restraints Control Module (RCM), make sure all of the connectors are properly connected, and the wiring harness is properly routed. Verify the resistance between the RCM assembly and body ground is less than 100 mΩ.

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B1241	Front driver airbag I °stage open circuit or over upper limit or vbatt voltage lost	Ignition switch: ON	Restraints Control Module (RCM) detected that the front driver airbag circuit is open.	• Spiral cable • Driver airbag • Driver airbag connector • Harness is open between spiral cable and RCM • RCM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the Restraints Control Module (RCM).
- Turn ignition switch off, and then turn the ignition switch on.
- With the scan tool, select view DTC and data stream in the RCM.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 14 Restraints for more information).

Diagnostic Guide Lines

Observe the following guide lines while diagnosing this DTC:

- Troubleshoot any Engine Control Module (ECM) charging/cranking DTCs before proceeding.
- If the warning lamp goes out immediately after the warning lamp flashed for 6 - 7 seconds, this indicates that the system is OK.
- If the warning lamp is on for 6 - 7 seconds continuously, then goes out, or the warning lamp is on continuously, this indicates that there are history DTCs in the system. Use the Scan Tool to erase the DTCs.
- If any other condition occurs, use the Scan Tool to erase the history DTCs first, then check the warning lamp. If the warning lamp does not go out immediately after the warning lamp flashes for 6 - 7 seconds when using the Scan Tool, erase the history DTCs first.
- In the course of troubleshooting the airbag system, make sure the system power supply is shut off, and wait two minutes for the system capacitor to discharge.
- The squib circuit connectors integrate a ″shorting″ spring (which prevents the airbag from deploying unintentionally due to static electricity by shorting the positive wire to the negative wire in the squib circuit when the connectors are disconnected). Therefore, if the airbag electrical connector or spiral cable electrical connector is damaged or improperly connected, the shorting spring may not be released when the electrical connector is connected.
- The following tools are required to perform the following test:
    - X-431 Scan Tool
    - Airbag Special Load Tool
    - Digital Multimeter

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK DRIVER AIRBAG

- Turn ignition switch off.
- Disconnect the negative battery cable.

WARNING!

To avoid serious or fatal injury, turn ignition switch off, disconnect the negative battery cable and wait two minutes before proceeding.

- Disconnect driver airbag electrical connector J-003.

NOTE :
Check connectors - Clean and repair as necessary.

- Connect the airbag special load tool (connect special tool dummy resistor to special tool resistor harness) to the spiral cable side of the vehicle harness (in place of the driver airbag).

WARNING!

To avoid serious or fatal injury, the driver airbag should not be checked with a multimeter.

NOTE :
If the airbag special load tool is not available, connect a known good driver airbag.

- Connect the negative battery cable.

WARNING!

To avoid serious or fatal injury, reconnect the battery, then turn ignition switch on.

- Turn ignition switch on.
- With the scan tool, erase the DTC memory.
- Turn ignition switch off, and wait a few seconds, then turn ignition switch on.
- With the scan tool, read the RCM DTCs

Is DTC B1241 present?

Yes >> Go to the next step.

No >> Replace the driver airbag (See Driver Airbag Removal & Installation in Section 14 Restraints). Reassemble the vehicle and road test to verify the customers complaint is repaired.

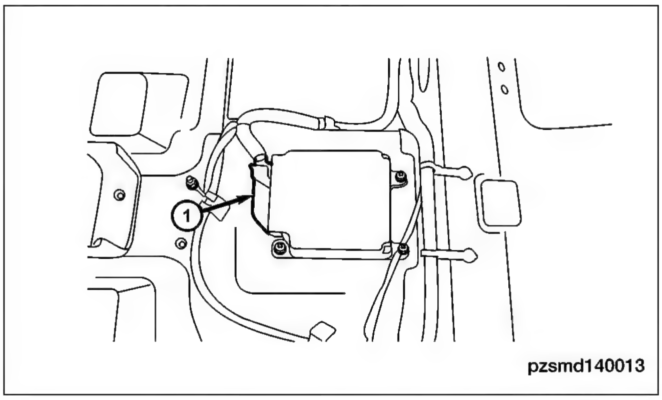
2. CHECK RESTRAINTS CONTROL MODULE (RCM) ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Restraints Control Module (RCM) electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



3. CHECK DRIVER AIRBAG CONTROL CIRCUITS

- Disconnect the airbag special load tool (or disconnect the known good driver airbag).

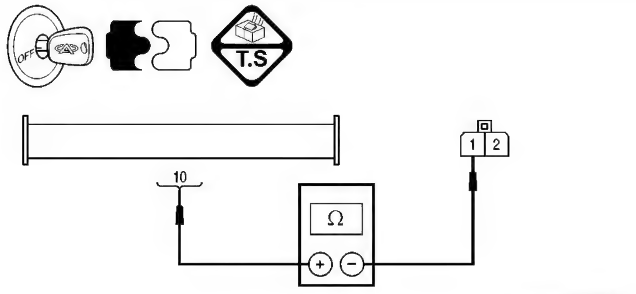
WARNING!

To avoid serious or fatal injury, turn the ignition switch off, disconnect the negative battery cable and wait two minutes before proceeding.

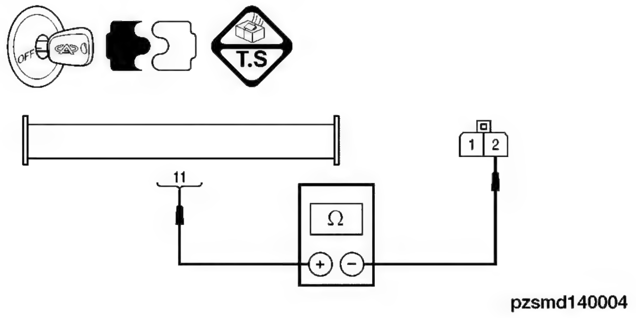
- Disconnect the spiral cable connector J-005.

NOTE :
Check connectors - Clean and repair as necessary.

- Check the continuity of the driver airbag circuit between the RCM electrical connector terminal 10 and the spiral cable electrical connector terminal 1.

SPIRAL CABLE TERMINAL	RCM TERMINAL	CONTINUITY	
1	10	Yes	

- Check the continuity of the driver airbag circuit between the RCM electrical connector terminal 11 and the spiral cable electrical connector terminal 2.

<table>
<tr><th>SPIRAL CABLE TERMINAL</th><th>RCM TERMINAL</th><th>CONTINUITY</th><td rowspan="2">
</td></tr>
<tr><td>2</td><td>11</td><td>Yes</td></tr>
</table>

- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

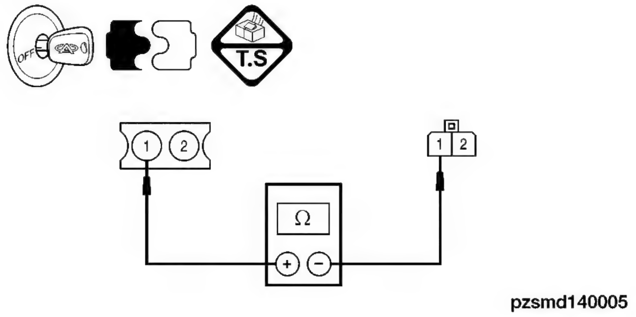
No >> Replace the driver airbag circuit between the RCM electrical connector terminals and the spiral cable electrical connector terminals.

4. CHECK DRIVER AIRBAG CONTROL CIRCUITS

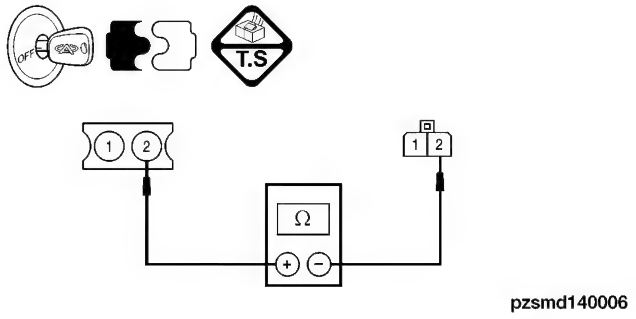
WARNING!

To avoid serious or fatal injury, turn the ignition switch off, disconnect the negative battery cable and wait two minutes before proceeding.

- Check the continuity of the driver airbag circuit between the driver airbag electrical connector terminal 1 and the spiral cable electrical connector terminal 1.

<table>
<tr><th>SPIRAL CABLE TERMINAL</th><th>DRIVER AIRBAG TERMINAL</th><th>CONTINUITY</th><td rowspan="2">
</td></tr>
<tr><td>1</td><td>1</td><td>Yes</td></tr>
</table>

- Check the continuity of the driver airbag circuit between the RCM electrical connector terminal 2 and the spiral cable electrical connector terminal 2.

SPIRAL CABLE TERMINAL	DRIVER AIRBAG TERMINAL	CONTINUITY	 OFF T.S 1 2 1 2 Ω + − pzsmd140006
2	2	Yes	

- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the spiral cable.

5. CHECK CONNECTORS

NOTE :
Diagnose and repair all active codes before diagnosing stored codes (See Restraints Control Module DTC List in Section 14 Restraints).

- With the scan tool, record and erase all RCM DTCs.
- Using the electrical schematic as a guide, inspect the following:
  - Inspect the wiring and connectors of the related airbag system wiring and connectors.
  - Look for any chafed, pierced, pinched, or partially broken wires.
  - Look for broken, bent, pushed out or corroded terminals.
  - Verify that there is good pin to terminal contact in the related connectors.

Were any problems found?

Yes >> Replace as necessary.

No >> Go to the next step.

6. CHECK DTC

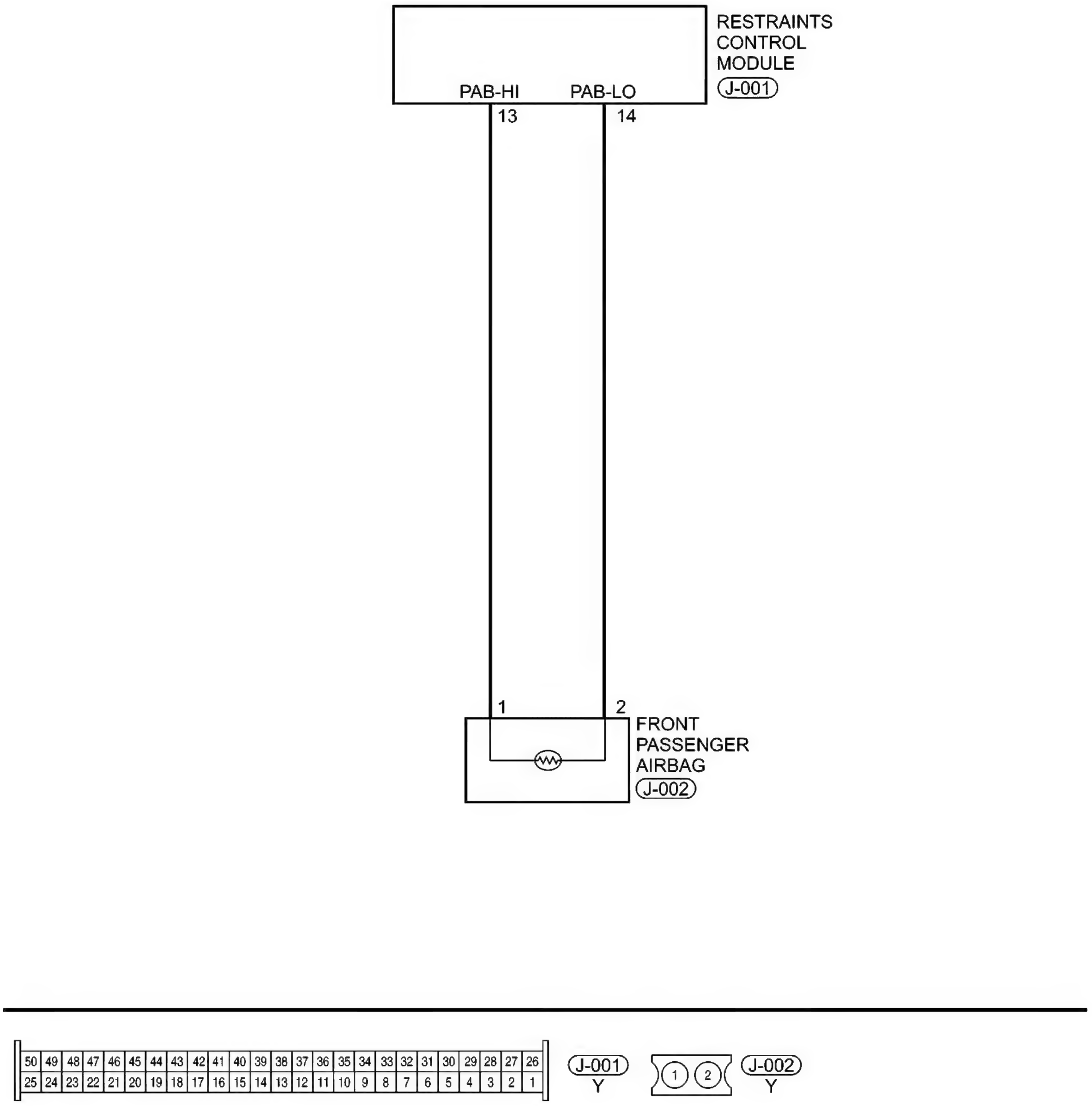
- Reconnect all disconnected components and harness connectors.
- With the X-431 scan tool, read the RCM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is the DTC B1241 still present?

Yes >> Replace the RCM.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

B1245 - Front Passenger Airbag I °STAGE Open Circuit or Over Upper Limit or Vbatt Voltage Lost


RESTRAINTS
CONTROL
MODULE
J-001
PAB-HI
PAB-LO
13
14
1
2
FRONT
PASSENGER
AIRBAG
J-002
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
J-001
Y
1 2
J-002
Y

pzsmw140009t

NOTE :
The Restraints Control Module (RCM) ground pin must be connected to the vehicle chassis in the immediate location of the RCM mounting area.

WARNING!

After installing the Restraints Control Module (RCM), make sure all of the connectors are properly connected, and the wiring harness is properly routed. Verify the resistance between the RCM assembly and body ground is less than 100 mΩ.

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B1245	Front passenger airbag I °stage open circuit or over upper limit or vbatt voltage lost	Ignition switch: ON	Restraints Control Module (RCM) detected that the front passenger airbag circuits is open.	• Passenger airbag • Passenger airbag connector • Harness is open between passenger airbag and RCM • RCM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.
- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the Restraints Control Module (RCM).
- Turn ignition switch off, and then turn the ignition switch on.
- With the scan tool, select view DTC and data stream in the RCM.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 14 Restraints for more information).

Diagnostic Guide Lines

Observe the following guide lines while diagnosing this DTC:
- Troubleshoot any Engine Control Module (ECM) charging/cranking DTCs before proceeding.
- If the warning lamp goes out immediately after the warning lamp flashed for 6 - 7 seconds, this indicates that the system is OK.
- If the warning lamp is on for 6 - 7 seconds continuously, then goes out, or the warning lamp is on continuously, this indicates that there are history DTCs in the system. Use the Scan Tool to erase the DTCs.
- If any other condition occurs, use the Scan Tool to erase the history DTCs first, then check the warning lamp. If the warning lamp does not go out immediately after the warning lamp flashes for 6 - 7 seconds when using the Scan Tool, erase the history DTCs first.
- In the course of troubleshooting the airbag system, make sure the system power supply is shut off, and wait two minutes for the system capacitor to discharge.
- The squib circuit connectors integrate a ″shorting″ spring (which prevents the airbag from deploying unintentionally due to static electricity by shorting the positive wire to the negative wire in the squib circuit when the connectors are disconnected). Therefore, if the airbag electrical connector or spiral cable electrical connector is damaged or improperly connected, the shorting spring may not be released when the electrical connector is connected.
- The following tools are required to perform the following test:
  - X-431 Scan Tool
  - Airbag Special Load Tool
  - Digital Multimeter

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK THE PASSENGER AIRBAG

- Turn ignition switch off.
- Disconnect the negative battery cable.

WARNING!

To avoid serious or fatal injury, turn ignition switch off, disconnect the negative battery cable and wait two minutes before proceeding.

- Disconnect passenger airbag electrical connector J-002.

NOTE :
Check connectors - Clean and repair as necessary.

- Connect the airbag special load tool (connect special tool dummy resistor to special tool resistor harness) to the vehicle harness (in place of the passenger airbag).
- Connect the negative battery cable.

WARNING!

To avoid serious or fatal injury, the passenger airbag should not be checked by a multimeter.

NOTE :
If the airbag special load tool is not available, connect a known good passenger airbag.

WARNING!

To avoid serious or fatal injury, reconnect the battery, then turn ignition switch on.

- Turn ignition switch on.
- With the scan tool, erase the DTC memory.
- Turn ignition switch off, and wait a few seconds, then turn ignition switch on.
- With the scan tool, read the active RCM DTCs

Is DTC B1245 present?

Yes >> Go to the next step.

No >> Replace the passenger airbag (See Passenger Airbag Removal & Installation in Section 14 Restraints). Reassemble the vehicle and road test to verify the customers complaint is repaired.

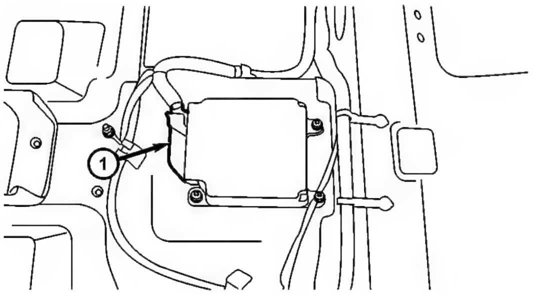
2. CHECK RESTRAINTS CONTROL MODULE (RCM) ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Restraints Control Module (RCM) electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



pzsmd140013

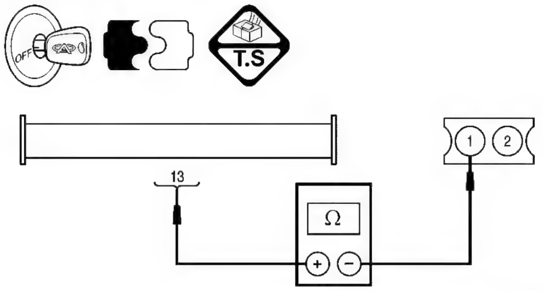
3. CHECK THE PASSENGER AIRBAG CONTROL CIRCUITS

- Disconnect the airbag special load tool (or disconnect the known good driver airbag).

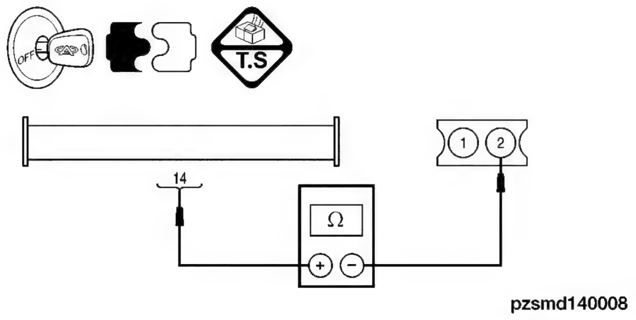
WARNING!

To avoid serious or fatal injury, turn the ignition switch off, disconnect the negative battery cable and wait two minutes before proceeding.

- Check the continuity of the passenger airbag circuit between the RCM electrical connector terminal 13 and passenger airbag electrical connector terminal 1.

FRONT PASSENGER AIRBAG CONNECTOR J-002 TERMINAL	RCM CONNECTOR J-001 TERMINAL	CONTINUITY	 pzsmd140007
1	13	Yes	

- Check the continuity of the passenger airbag circuit between the RCM electrical connector terminal 14 and passenger airbag electrical connector terminal 2.

FRONT PASSENGER AIRBAG CONNECTOR J-002 TERMINAL	RCM CONNECTOR J-001 TERMINAL	CONTINUITY	
2	14	Yes	

- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the cables.

4. CHECK CONNECTORS

NOTE :
Diagnose and repair all active codes before diagnosing stored codes (See Restraints Control Module DTC List in Section 14 Restraints).

- With the scan tool, record and erase all RCM DTCs.
- Using the electrical schematic as a guide, inspect the following:
  - Inspect the wiring and connectors of the related airbag system.
  - Look for any chafed, pierced, pinched, or partially broken wires.
  - Look for broken, bent, pushed out or corroded terminals.
  - Verify that there is good pin to terminal contact in the related connectors.

Were any problems found?

Yes >> Replace as necessary.

No >> Go to the next step.

5. CHECK DTC

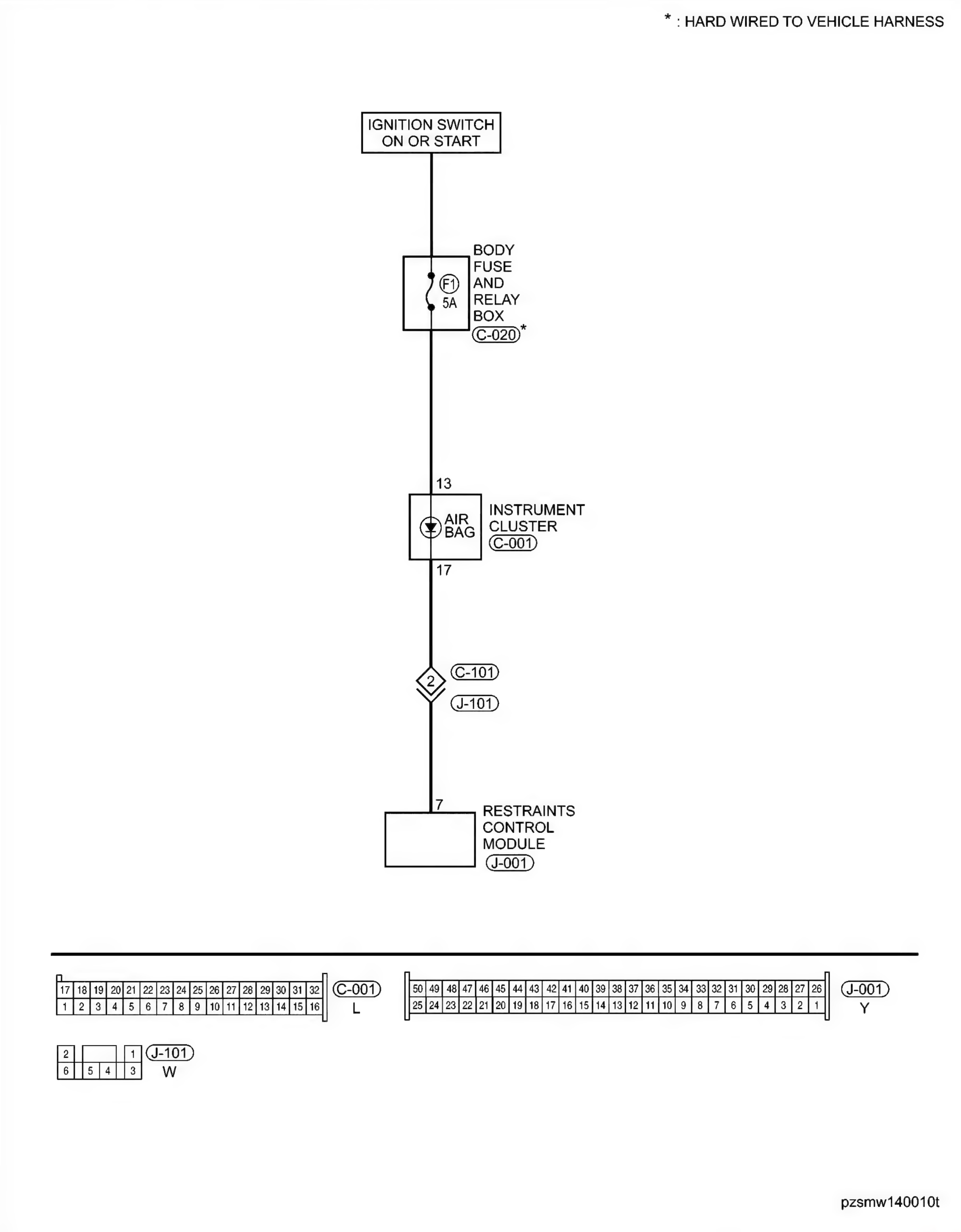
- Reconnect all disconnected components and harness connectors.
- With the X-431 scan tool, read the RCM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is the DTC B1245 still present?

Yes >> Replace the RCM.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

B2214 - Warning Lamp Short to Ground


* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
F1
5A
BODY FUSE AND RELAY BOX
C-020*
13
AIR BAG
INSTRUMENT CLUSTER
C-001
17
2
C-101
J-101
7
RESTRAINTS CONTROL MODULE
J-001
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-001
L
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
J-001
Y
2 1
6 5 4 3
J-101
W
pzsmw140010t

NOTE :
The Restraints Control Module (RCM) ground pin must be connected to the vehicle chassis in the immediate location of the RCM mounting area.

WARNING!

After installing the Restraints Control Module (RCM), make sure all of the connectors are properly connected, and the wiring harness is properly routed. Verify the resistance between the RCM assembly and body ground is less than 100 mΩ.

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B2214	Warning Lamp Short to Ground	Ignition switch: ON	This DTC will set if the airbag warning lamp driver circuit is shorted to ground or open between the airbag warning lamp and the Restraints Control Module (RCM).	• Instrument cluster • Harness is open or short between instrument cluster and RCM • RCM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on.
- With the scan tool, record and erase stored DTCs in the Restraints Control Module (RCM).
- Turn ignition switch off, and then turn the ignition switch on.
- With the scan tool, select view DTC and data stream in the RCM.
- If the DTC is detected, the DTC condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 14 Restraints for more information).

Diagnostic Guide Lines

Observe the following guide lines while diagnosing this DTC:

- Troubleshoot any Engine Control Module (ECM) charging/cranking DTCs before proceeding.
- If the warning lamp goes out immediately after the warning lamp flashed for 6 - 7 seconds, this indicates that the system is OK.
- If the warning lamp is on for 6 - 7 seconds continuously, then goes out, or the warning lamp is on continuously, this indicates that there are history DTCs in the system. Use the Scan Tool to erase the DTCs.
- If any other condition occurs, use the Scan Tool to erase the history DTCs first, then check the warning lamp. If the warning lamp does not go out immediately after the warning lamp flashes for 6 - 7 seconds when using the Scan Tool, erase the history DTCs first.
- In the course of troubleshooting the airbag system, make sure the system power supply is shut off, and wait two minutes for the system capacitor to discharge.
- The squib circuit connectors integrate a ″shorting″ spring (which prevents the airbag from deploying unintentionally due to static electricity by shorting the positive wire to the negative wire in the squib circuit when the connectors are disconnected). Therefore, if the airbag electrical connector or spiral cable electrical connector is damaged or improperly connected, the shorting spring may not be released when the electrical connector is connected.
- The following tools are required to perform the following test:
  - X-431 Scan Tool
  - Airbag Special Load Tool
  - Digital Multimeter

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK RCM DTC

- Perform the DTC Confirmation Procedure.

Is DTC B2214 present?

Yes >> Go to the next step.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

2. CHECK WARNING LAMP

- Turn ignition switch off, and wait a few seconds, then turn ignition switch on. Observe the airbag warning lamp.

Is the airbag warning lamp not illuminated with the ignition switch ON?

Yes >> Go to the next step.

No >> Go to step 4.

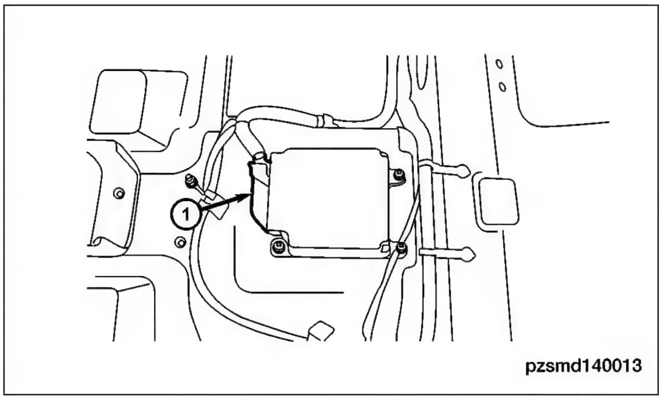
3. CHECK RESTRAINTS CONTROL MODULE (RCM) ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Restraints Control Module (RCM) electrical connector (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



4. CHECK WARNING LAMP CIRCUITS

WARNING!

To avoid serious or fatal injury, turn ignition switch off, disconnect the negative battery cable and wait two minutes before proceeding.

- Disconnect the instrument cluster electrical connector C-001.
- Disconnect the body fuse and relay box C-020.

NOTE :
Check connectors - Clean and repair as necessary.

- Check fuse F1 (5A).
- Measure the following circuits with a digital multimeter:
- Measure the harness for an open between the body fuse and relay box C-020 (fuse F1) and instrument cluster electrical connector C-001 (terminal 13).
- Check harness connector C-101 & J-101, terminal 2.
- Measure the harness for open between the instrument cluster C-001 (terminal 17) and RCM electrical connector J-001 (terminal 7).
- Check the harness for continuity.
- Continuity should exist.
- Check the continuity between harness and ground.
- Continuity should not exist.

Is the check result normal?

Yes >> Replace the instrument cluster.
If DTC is still present, go to the next step.

No >> Repair the harness wires between the RCM electrical connector J-001 (terminal 7) and instrument cluster C-001 (terminal 17) and the harness wires between instrument cluster C-001 (terminal 13) and body fuse and relay box C-020 for an open or short to ground.

5. CHECK CONNECTORS

NOTE :
Diagnose and repair all active codes before diagnosing stored codes (See Restraints Control Module DTC List in Section 14 Restraints).

- With the scan tool, record and erase all RCM DTCs.
- Using the electrical schematic as a guide, inspect the following:
  - Inspect the wiring and connectors of the related airbag system.
  - Look for any chafed, pierced, pinched, or partially broken wires.
  - Look for broken, bent, pushed out or corroded terminals.
  - Verify that there is good pin to terminal contact in the related connectors.

Were any problems found?

Yes >> Repair as necessary.

No >> Reconnect all disconnected components and harness connectors.
Go to the next step.

6. CHECK DTC

- With the X-431 scan tool, read the RCM DTCs.
- Refer to DTC Confirmation Procedure .

Is DTC B2214 still present?

Yes >> Replace the RCM.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

ON-VEHICLE SERVICE

Airbag System Disarming Procedure

Description

WARNING!

The steering column contains the driver's airbag. The airbag system is a sensitive, complex electro-mechanical unit. Before attempting to diagnose, remove or install the airbag system components, you must first disconnect and isolate the negative battery (ground) cable. Then wait two minutes for the system capacitor to discharge. Failure to do so could result in accidental deployment of the airbag and possible personal injury. The fasteners, screws, and bolts, originally used for the airbag components, have special coatings and are specifically designed for the airbag system. They must never be replaced with any substitutes. Anytime a new fastener is needed, replace with the correct fasteners provided in the service package or fasteners listed in the parts books.

1. Turn the ignition off.
2. Disconnect and isolate the negative battery cable.
3. Wait two minutes for the system capacitor to discharge.
4. The airbag system can now be serviced safely.

Driver Airbag

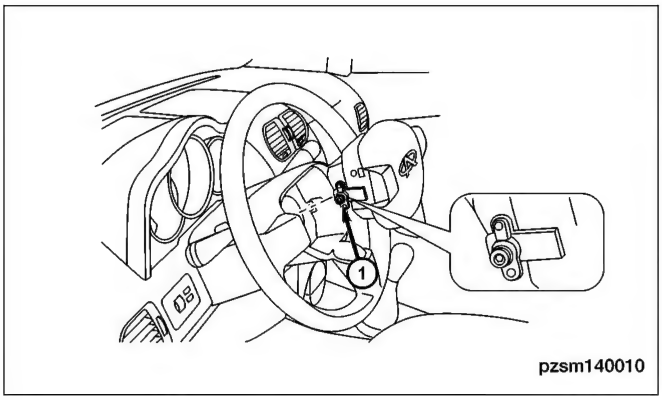
Removal & Installation

1. Turn ignition switch off.
2. Disconnect the negative battery cable.

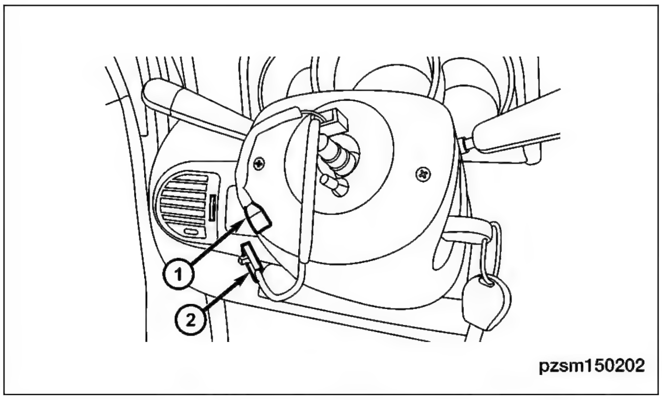
WARNING!

Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag development, serious or fatal injury (See Airbag System Disarming Procedure in Section 14 Restraints).

3. Loosen the two driver airbag retaining bolts.
   (Tighten: Driver airbag retaining bolts to 10 N·m)
4. Remove the driver side airbag.



5. Disconnect the airbag squib electrical connector (2).
6. Disconnect the horn switch ground cable (1).



7. Installation is in the reverse order of removal.

Front Passenger Airbag

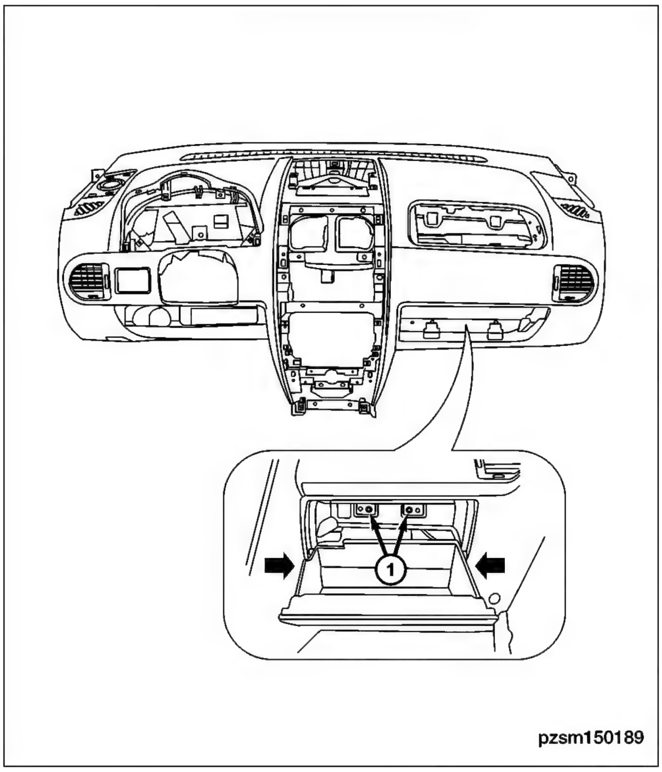
Removal & Installation

1. Turn ignition switch off.
2. Disconnect the negative battery cable.

WARNING!

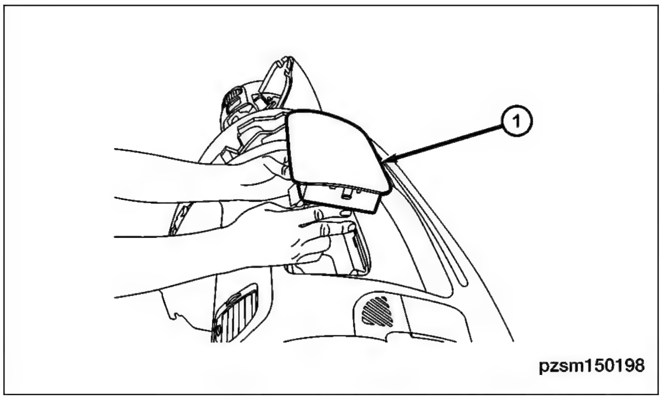
Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag development, serious or fatal injury (See Airbag System Disarming Procedure in Section 14 Restraints).

3. Open the glove box.
4. Remove the front passenger airbag mounting bolts (1).



5. Remove the instrument panel (See Instrument Panel Removal & Installation in Section 15 Body & Accessories).
6. Disconnect the front passenger airbag squib electrical connector.

7. Remove the front passenger airbag (1) from the instrument panel.



8. Installation is in the reverse order of removal.

Restraints Control Module (RCM)

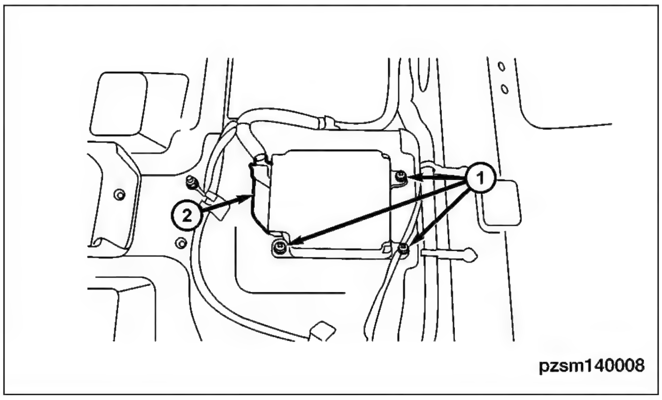
Removal & Installation

1. Disconnect the negative battery cable.

WARNING!

Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag development, serious or fatal injury (See Airbag System Disarming Procedure in Section 14 Restraints).

2. Remove the lower console (See Lower Console Removal & Installation in Section 15 Body & Accessories).
3. Disconnect the Restraints Control Module (RCM) electrical connector (2).
4. Remove the RCM retaining bolts (1).
   (Tighten: RCM retaining bolts to 10 N·m)



5. Remove the RCM from the vehicle.
6. Installation is in the reverse order of the removal.

SEAT BELT SYSTEM

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GENERAL INFORMATION

Description

The primary passenger restraints are the seat belts. Seat belts are referred to as an active restraint because the vehicle occupants are required to physically fasten and properly adjust these restraints in order to benefit from them.

Operation

The passive restraints are referred to as a supplemental restraint system because they were designed and are intended to enhance the protection for the occupants of the vehicle only when used in conjunction with the seat belts.

Specifications

Torque Specifications

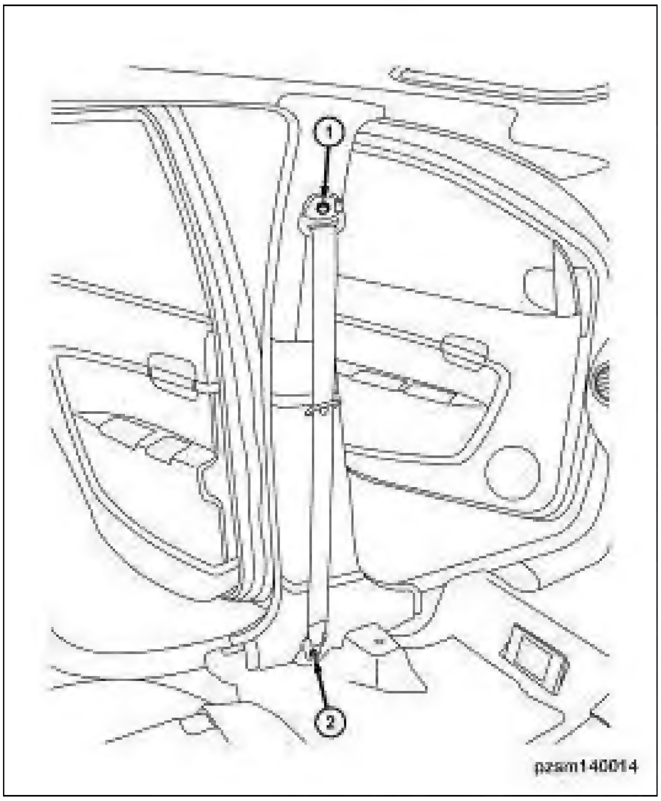
DESCRIPTION	TORQUE (N·m)
Adjustable Shoulder Belt Anchor Bolt	50
Front Seat Belt Buckle Retaining Bolt	50
Front Seat Belt Pre-Tensioner Lower Retaining Bolt	50
Rear Seat Belt Retaining Bolt	50
Rear Seat Belt Pre-Tensioner Retaining Bolt	50

ON-VEHICLE SERVICE

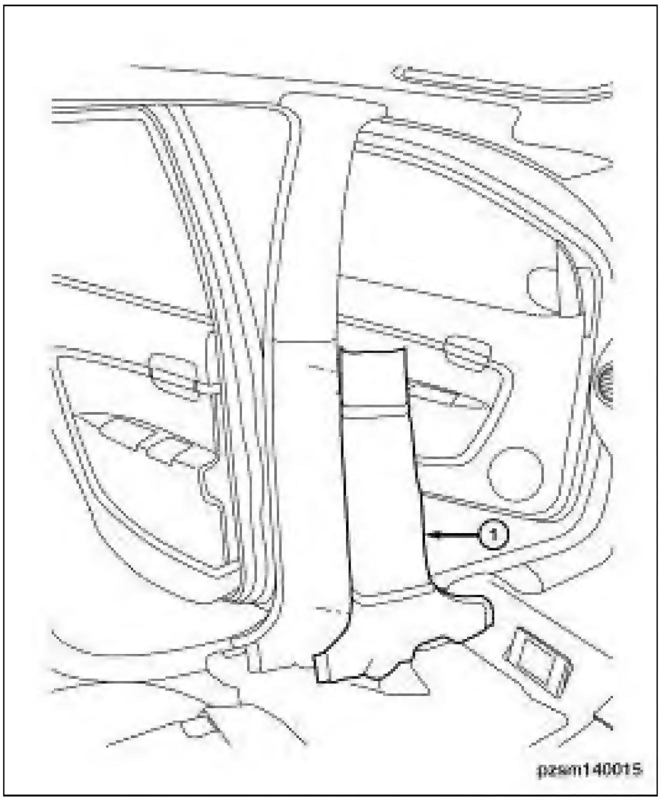
Front Seat Belt and Pre-Tensioner

Removal & Installation

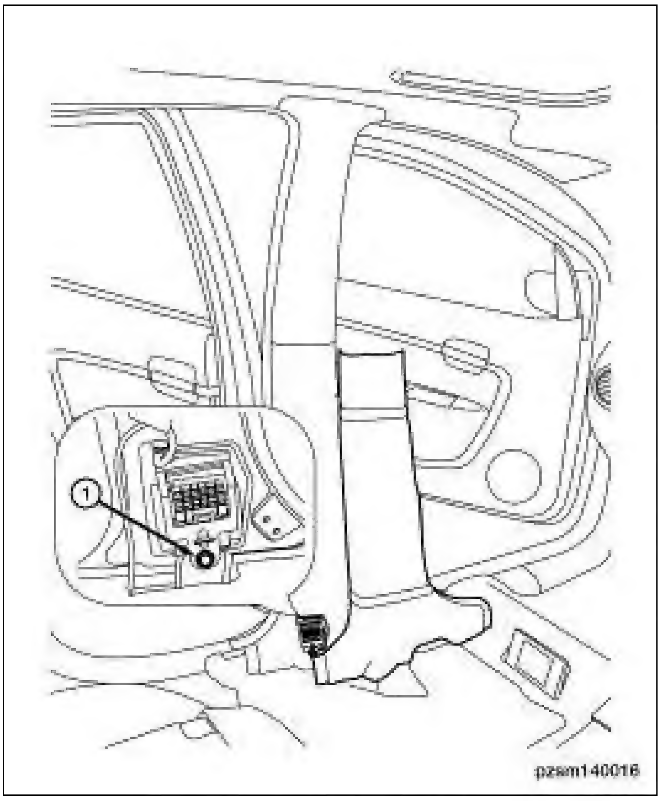
1. Remove the seat belt upper mounting bolt (1).
2. Remove the seat belt lower mounting bolt (2).



3. Using a trim stick, remove the B-pillar lower trim panel (1).



4. Remove the front seat belt pre-tensioner retaining bolt (1).
   (Tighten: Front seat belt retaining bolt to 50 N·m)

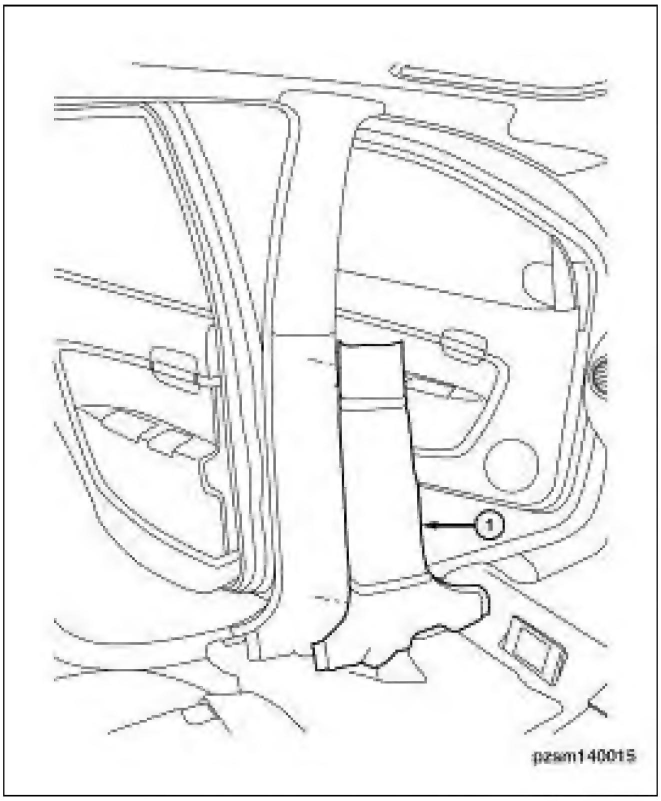


5. Remove the front seat belt and pre-tensioner.
6. Installation is in the reverse order of removal.

Adjustable Shoulder Belt Anchor

Removal & Installation

1. Remove the B-pillar lower trim panel (1).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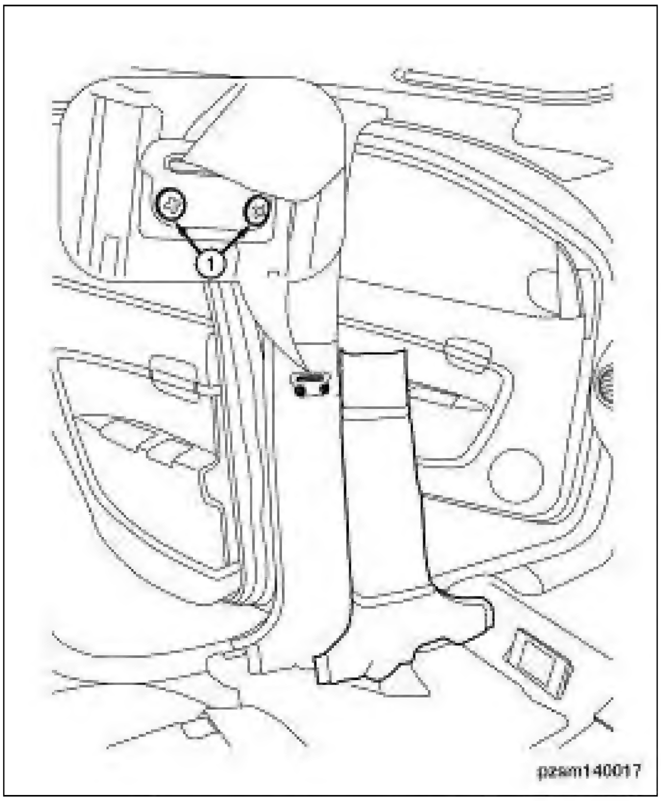
2. Remove the front seat belt bracket retaining screws (1).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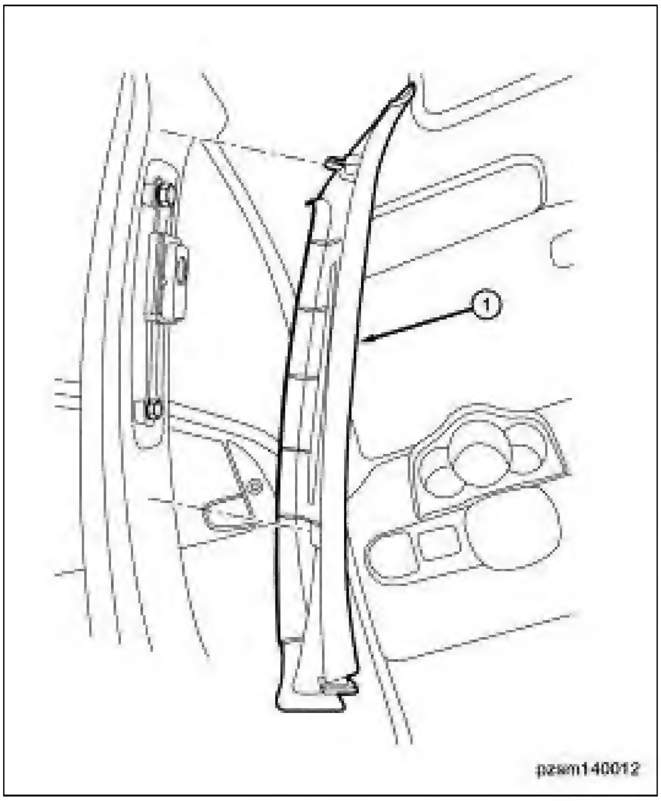
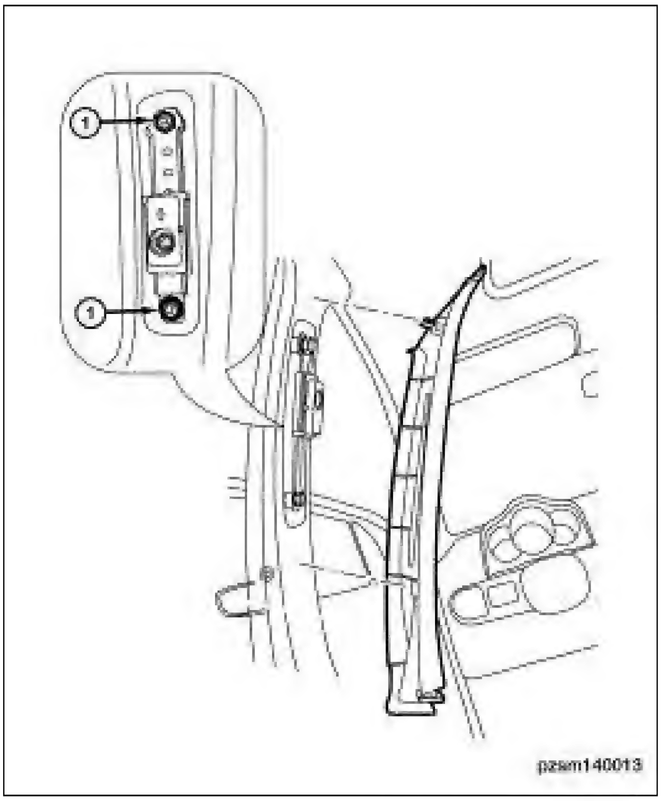
3. Using a trim stick, remove the B-pillar upper trim panel (1).



4. Remove the two adjustable shoulder belt anchor mounting bolts (1).
   (Tighten: Adjustable shoulder belt anchor bolts to 50 N·m)

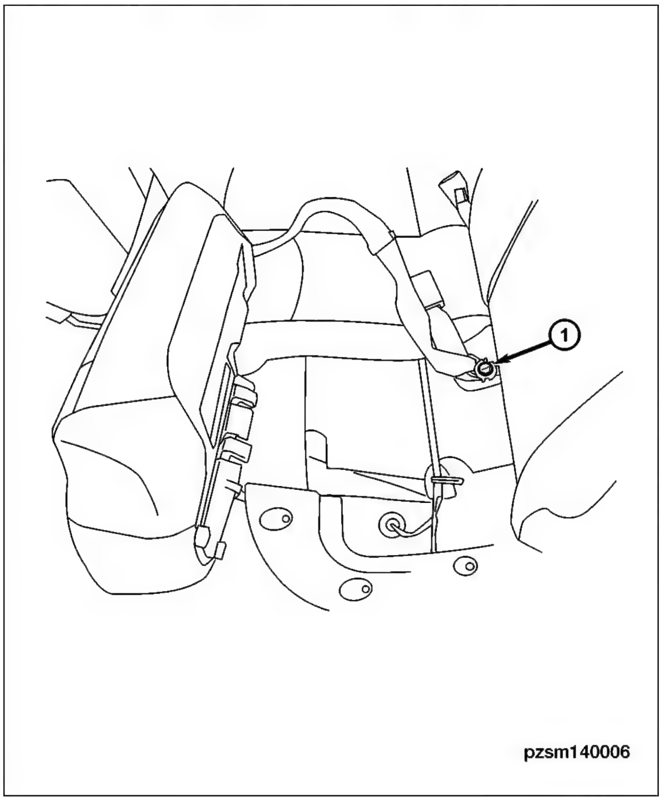


5. Remove the adjustable shoulder belt anchor.
6. Installation is in the reverse order of the removal.

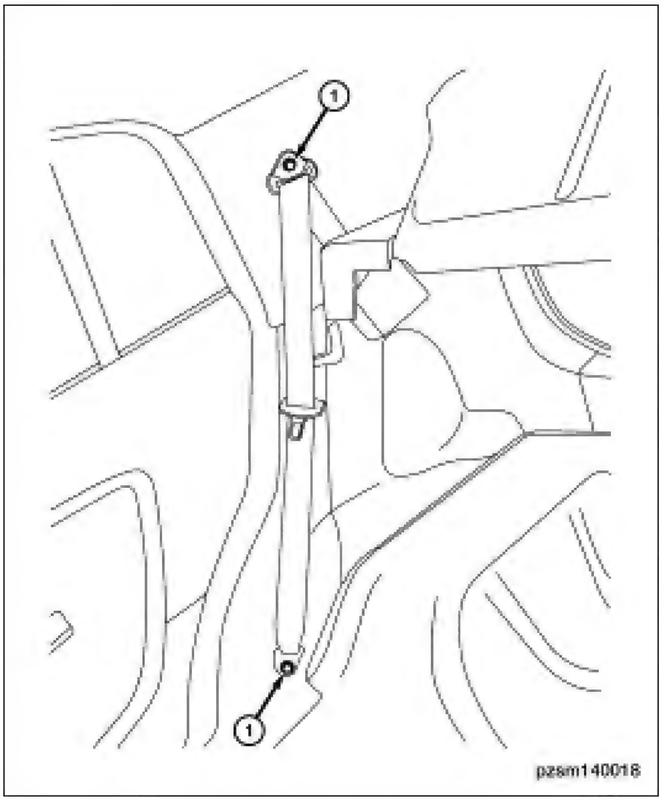
Rear Seat Belt and Tensioner

Removal & Installation

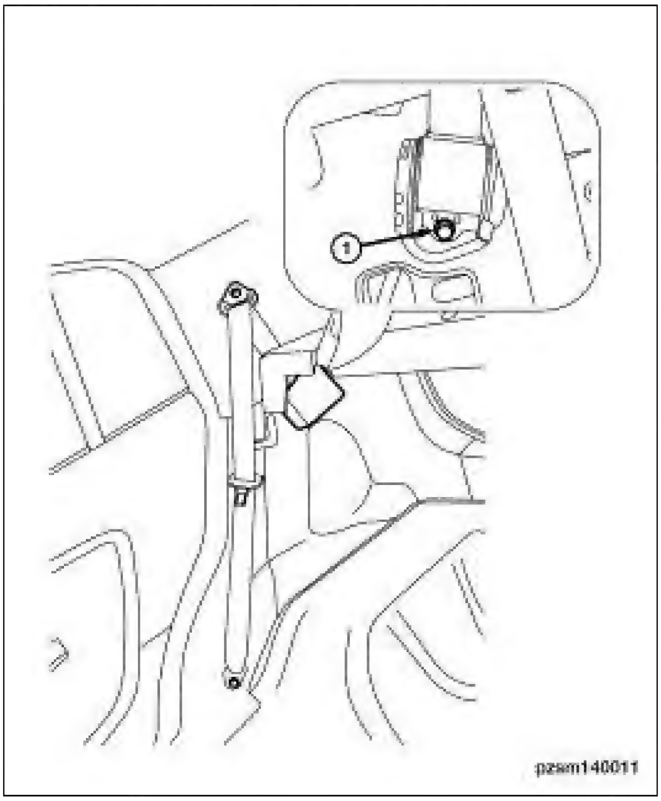
1. Remove the rear seat (See Rear Seat Removal & Installation in Section 15 Body & Accessories).
2. Remove the rear seat belt mounting bolts (1).
   (Tighten: Rear seat belt mounting bolts to 50 N·m)



3. Remove the two side seat belt mounting bolts (1).



4. Remove the C-pillar (See C-Pillar Removal & Installation in Section 15 Body & Accessories).
5. Remove the rear seat tensioner mounting bolt (1). (Tighten: Rear seat belt tensioner mounting bolt to 50 N·m)



6. Remove the tensioner.
7. Installation is in the reverse order of the removal.

BODY & ACCESSORIES

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AUDIO SYSTEM

Description

The audio system consists of the following components:

- Audio unit
- Two front door speakers
- Two front instrument panel tweeters
- Two rear hatch speakers
- Antenna (audio)

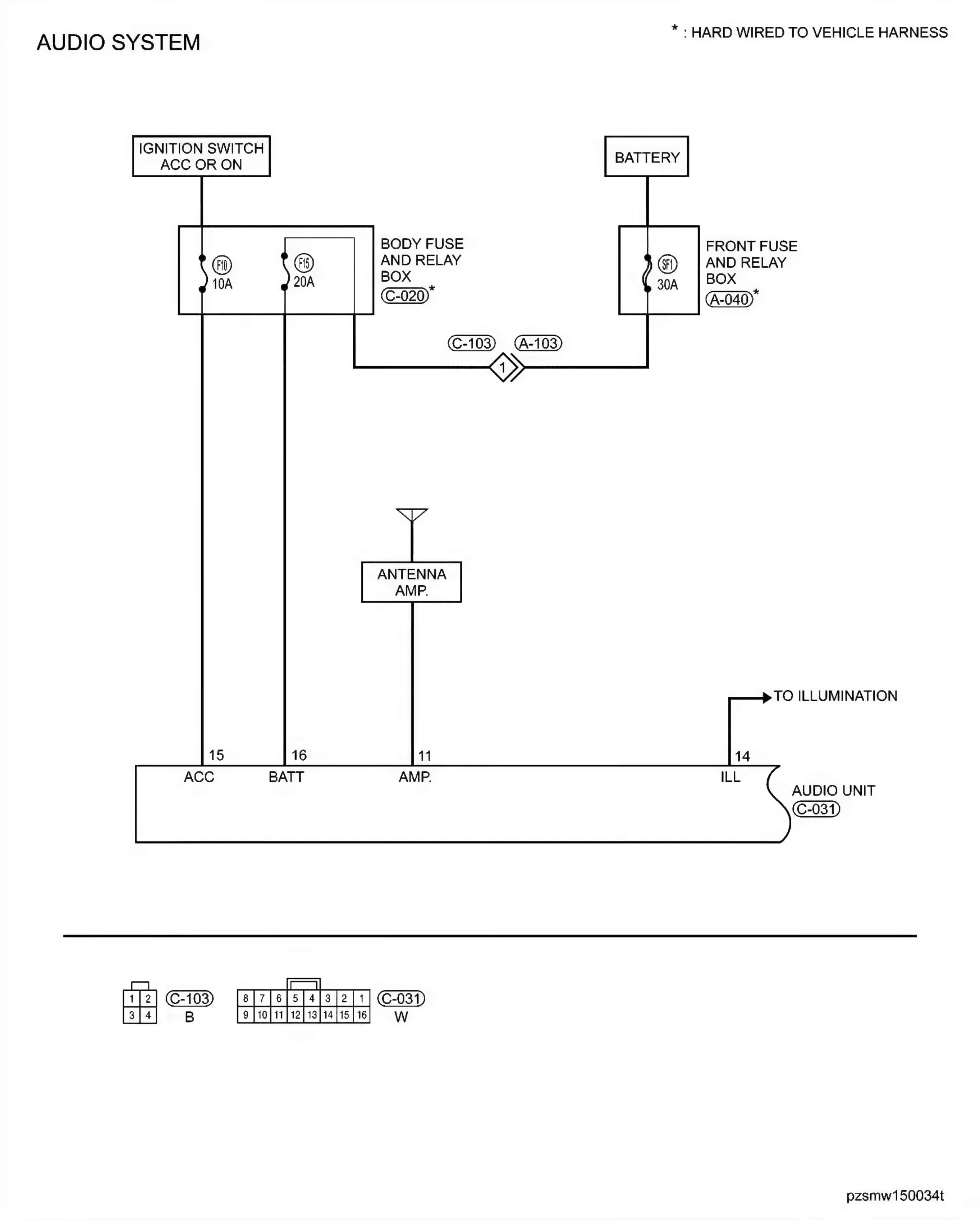
The audio system is standard factory-installed equipment. The system uses an ignition switched source of battery current so that the system will operate when the ignition switch is in the LOCK/ACC/ON positions. The radio will also operate for up to one hour with the ignition switch in the OFF position.

Operation

With audio system on, radio signals are received by the antenna, the audio unit then sends audio signals to front speakers, rear speakers and front tweeters.

Electrical Schematics

Audio System (Page 1 of 2)


AUDIO SYSTEM
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ACC OR ON
BATTERY
F10
10A
F15
20A
BODY FUSE AND RELAY BOX
C-020*
SF1
30A
FRONT FUSE AND RELAY BOX
A-040*
C-103
A-103
1
ANTENNA AMP.
TO ILLUMINATION
15
16
11
14
ACC
BATT
AMP.
ILL
AUDIO UNIT
C-031
1 2 3 4
C-103
B
8 7 6 5 4 3 2 1 9 10 11 12 13 14 15 16
C-031
W
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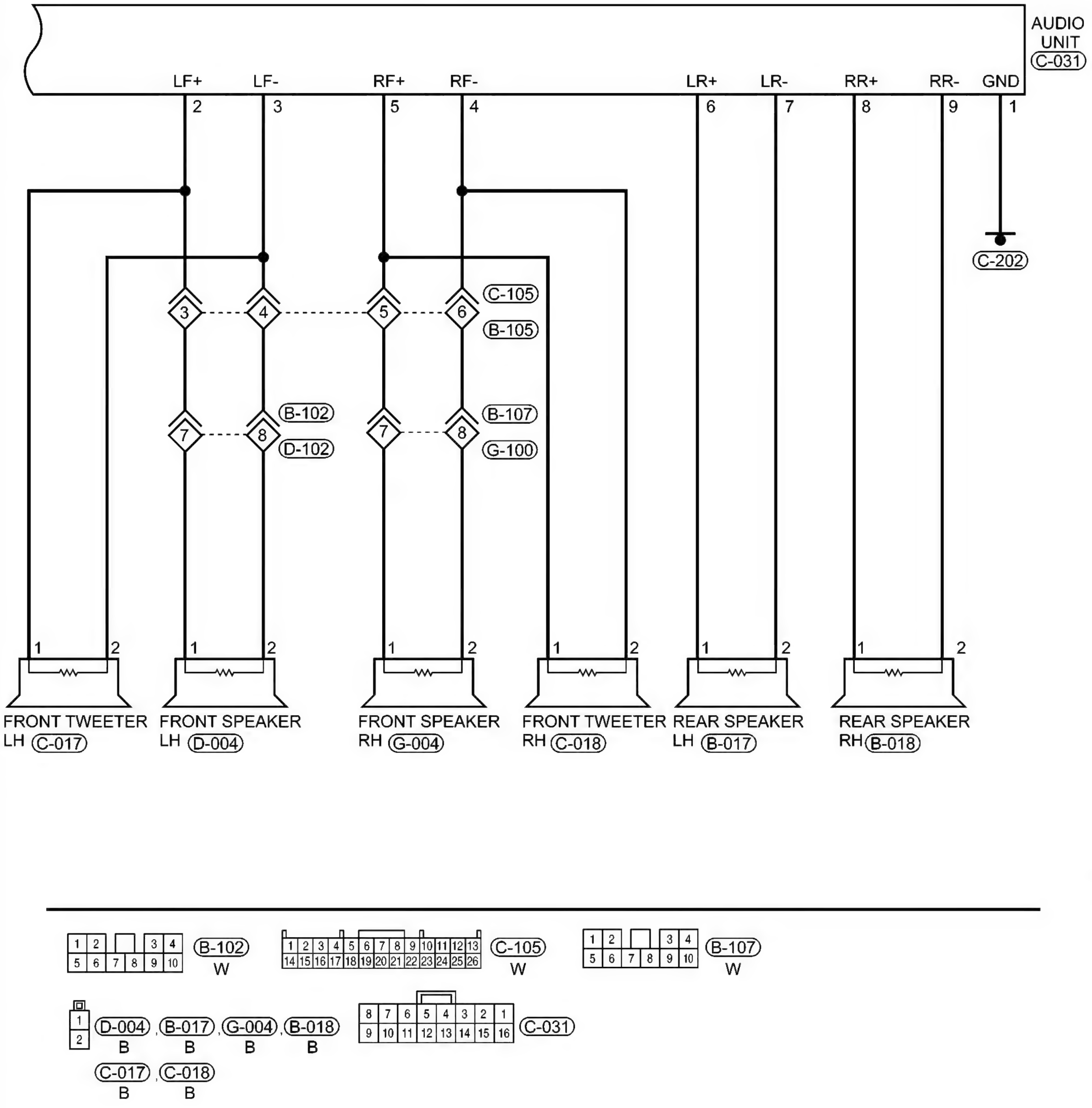
AUDIO UNIT
C-031
LF+
LF-
RF+
RF-
LR+
LR-
RR+
RR-
GND
2
3
5
4
6
7
8
9
1
C-202
C-105
B-105
3
4
5
6
B-102
D-102
7
8
B-107
G-100
7
8
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FRONT SPEAKER LH D-004
FRONT SPEAKER RH G-004
FRONT TWEETER RH C-018
REAR SPEAKER LH B-017
REAR SPEAKER RH B-018
B-102 W
C-105 W
B-107 W
D-004 B, B-017 B, G-004 B, B-018 B
C-017 B, C-018 B
C-031
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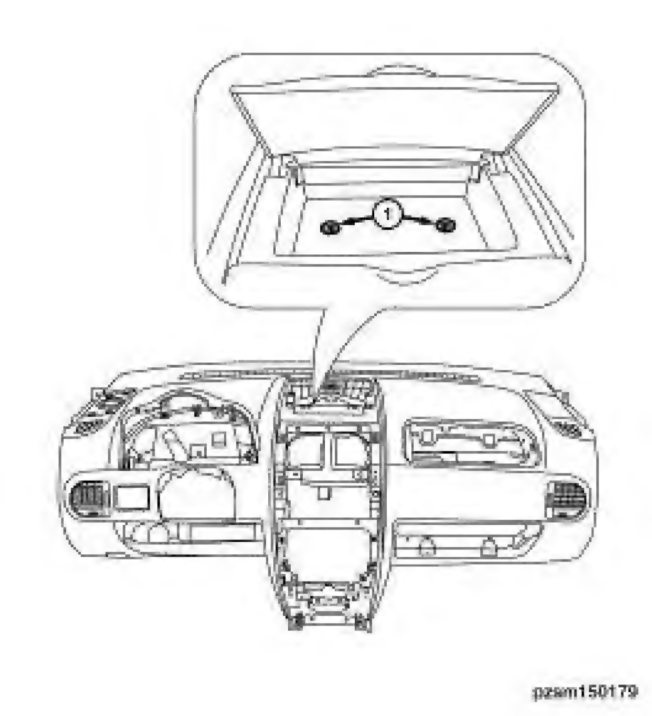
CD Player

Removal & Installation

1. Disconnect the negative battery cable.
2. Open the storage box over the console, and remove the two retaining screws (1).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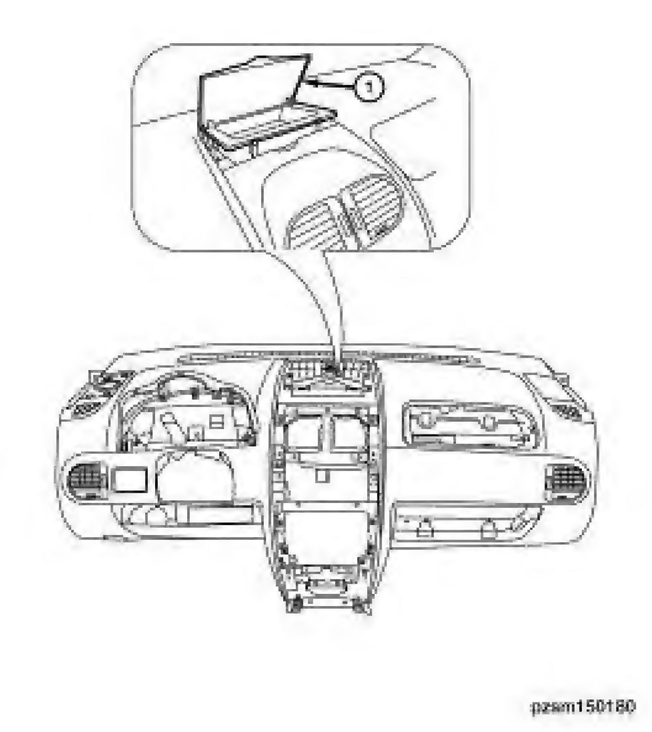
3. Using a trim stick, remove the storage box (1).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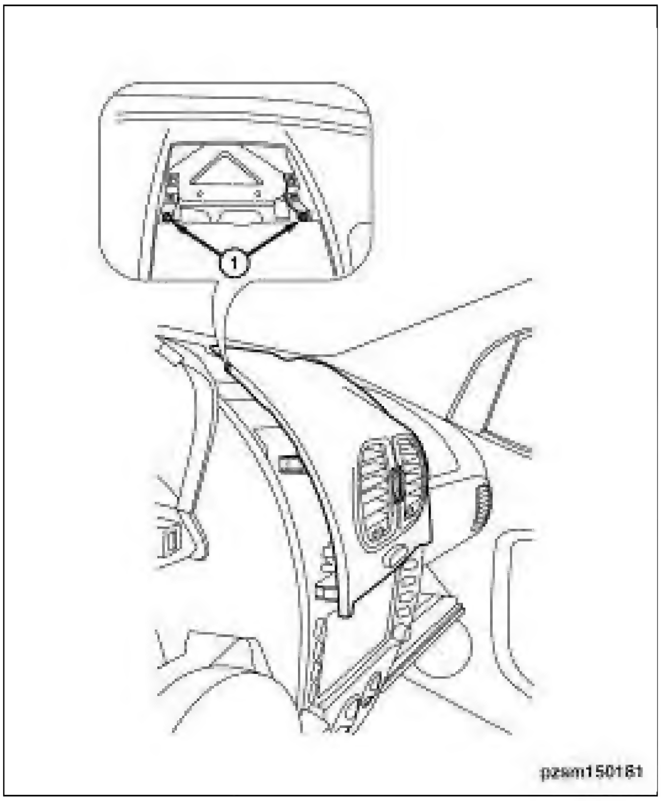
4. Remove the two upper cover retaining screws (1).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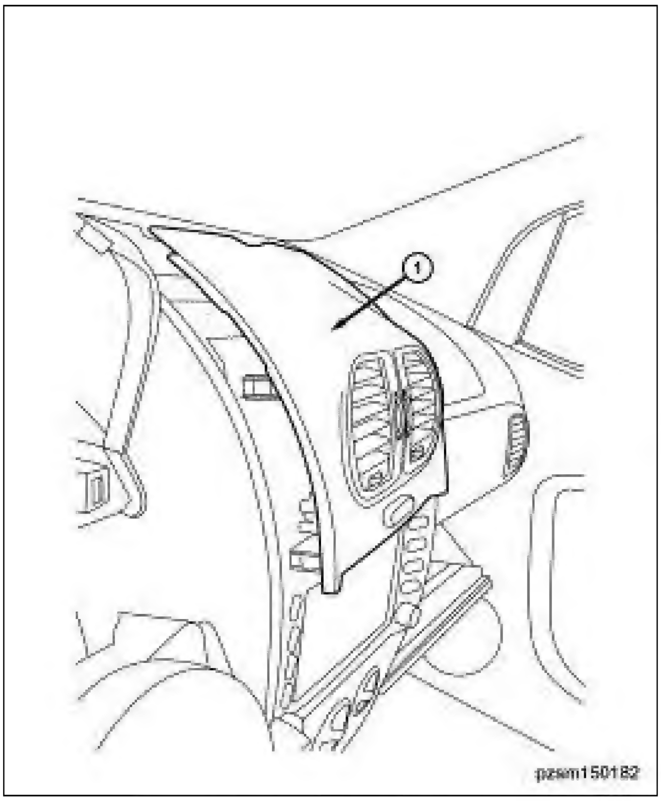
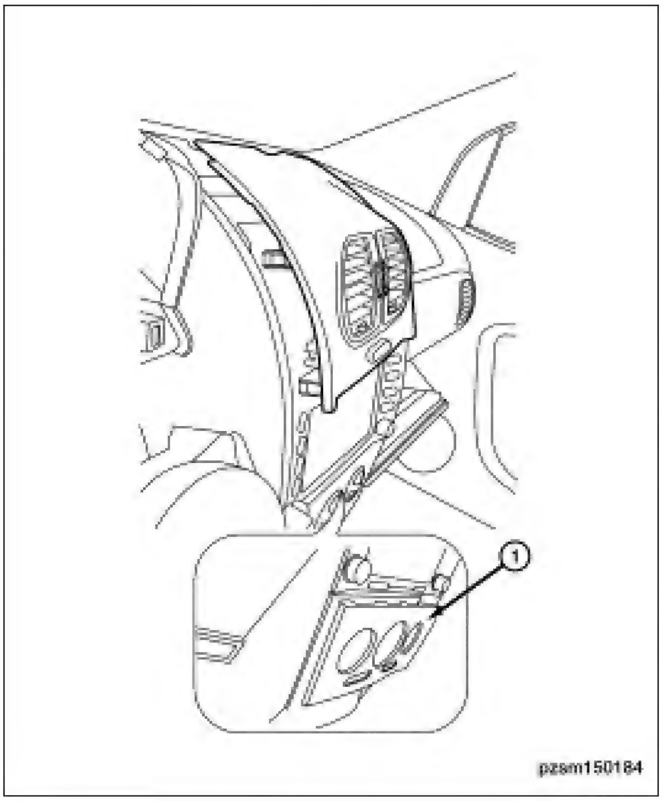
5. Using a trim stick, pry the lower cover.
6. Remove the center instrument panel cover (1).

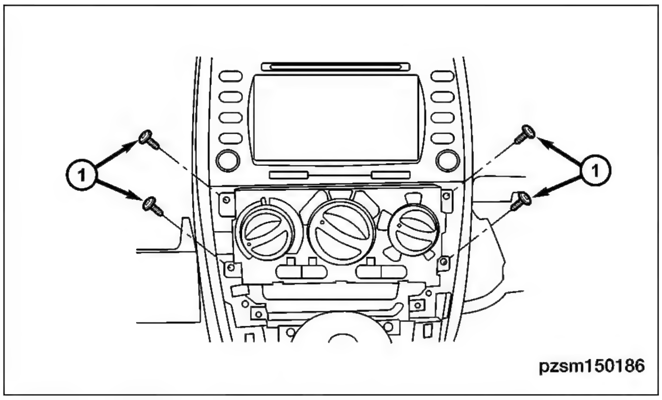

1
pzsm150182

7. Disconnect the emergency switch electrical connector.

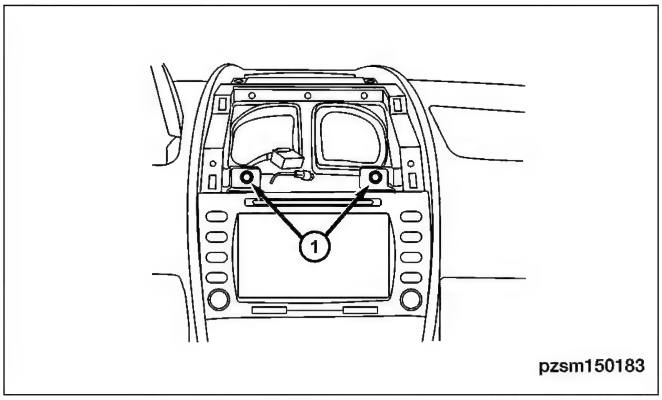
8. Using a trim stick, remove the HVAC control panel cover (1).



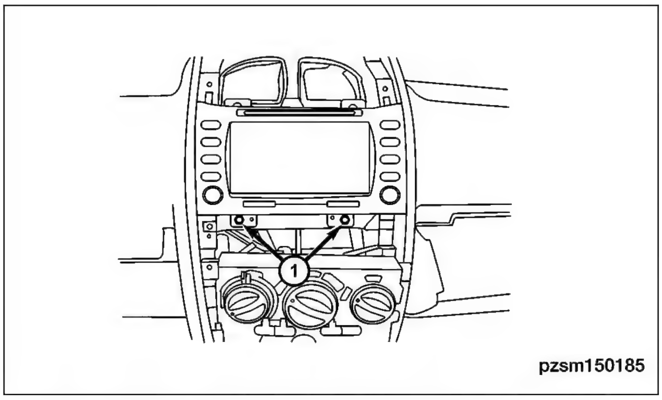
9. Remove the four HVAC control panel retaining screws (1).



10. Disconnect the two electrical connectors behind the HVAC control panel.
11. Remove the two control cables from the HVAC control panel.
12. Remove the HVAC control panel.
13. Remove the two upper CD player retaining bolts (1).



14. Remove the two lower CD player retaining bolts (1).

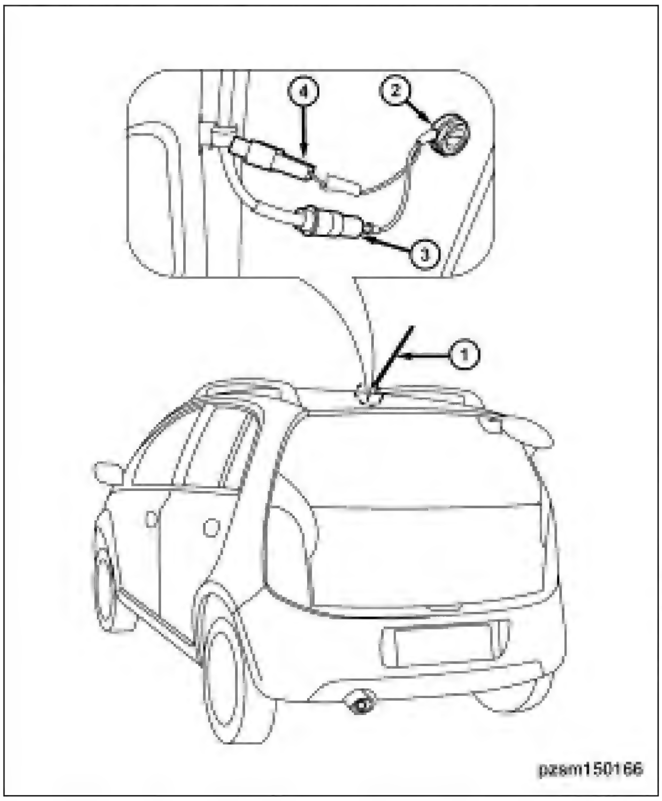


15. Disconnect the radio electrical connector and antenna connector.
16. Remove the CD player.
17. Installation is in the reverse order of removal.

Antenna

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the headliner (See Headliner Removal & Installation in Section 15 Body & Accessories).
3. Disconnect the antenna electrical connector (4).
4. Disconnect the antenna to CD player cable (3).
5. Remove the antenna retaining nut (2).
6. Remove the antenna (1).



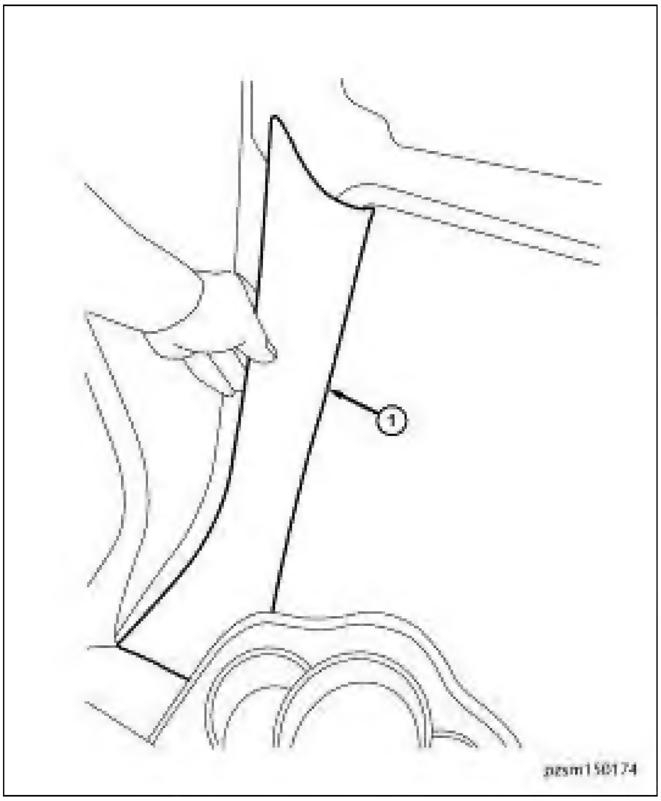
7. Installation is in the reverse order of removal.

BODY INTERIOR TRIM

A-Pillar Trim Panel

Removal & Installation

1. Using a trim stick, pry the A-pillar trim panel (1) to release the retaining clips.



2. Remove the A-pillar trim panel.
3. Installation is in the reverse order of removal.

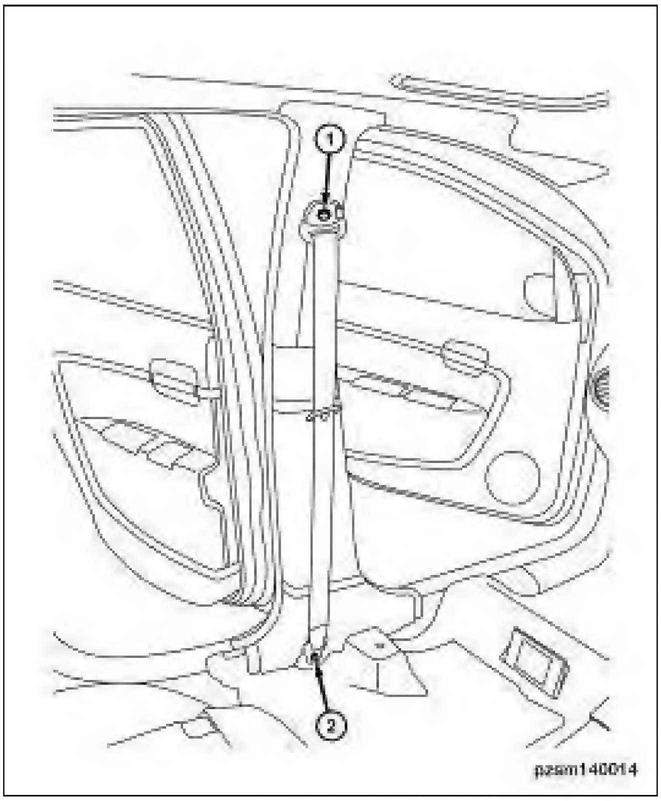
Installation Notes:

- The A-pillar trim panel clips should be installed to allow the trim panel a tight fit between the roof and the weatherstrip.

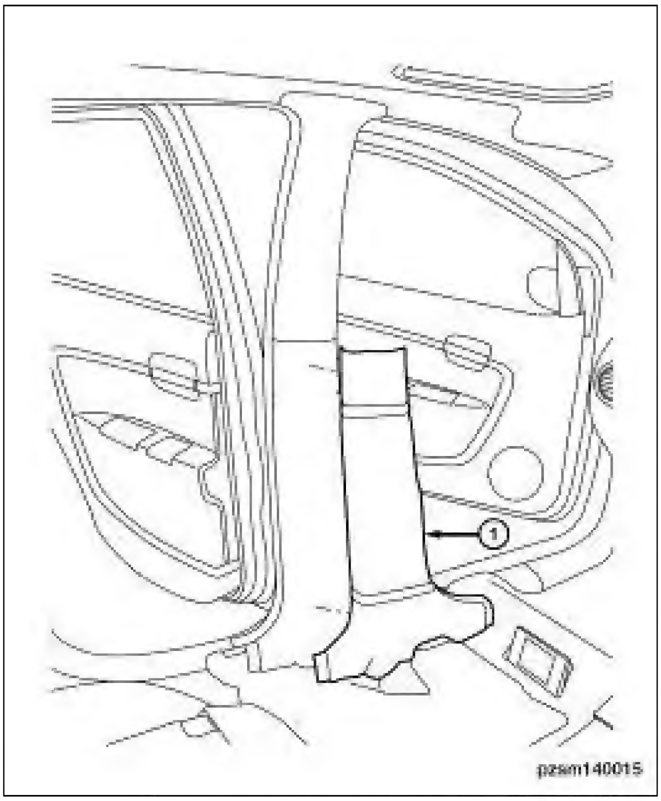
B-Pillar Trim Panel

Removal & Installation

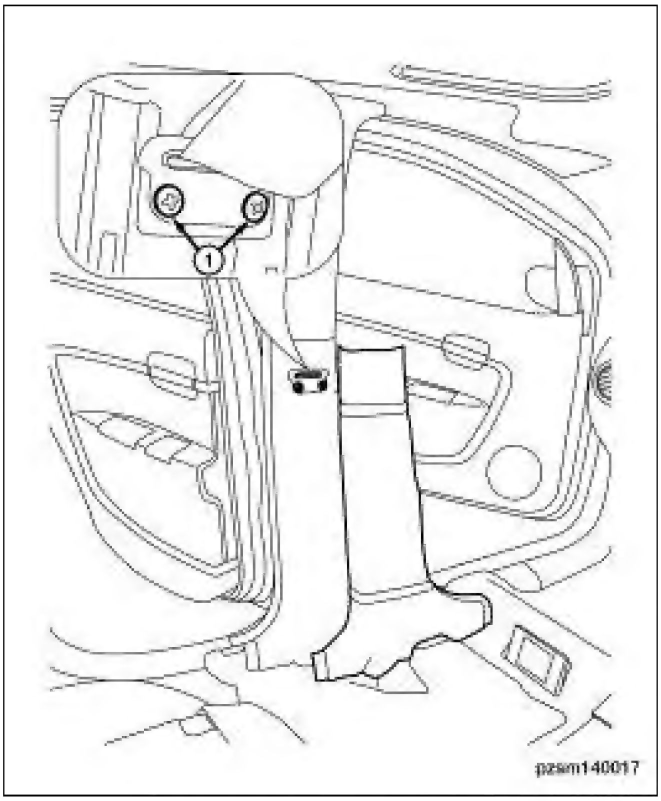
1. Remove the seat belt upper mounting bolt (1).
2. Remove the seat belt lower mounting bolt (2).



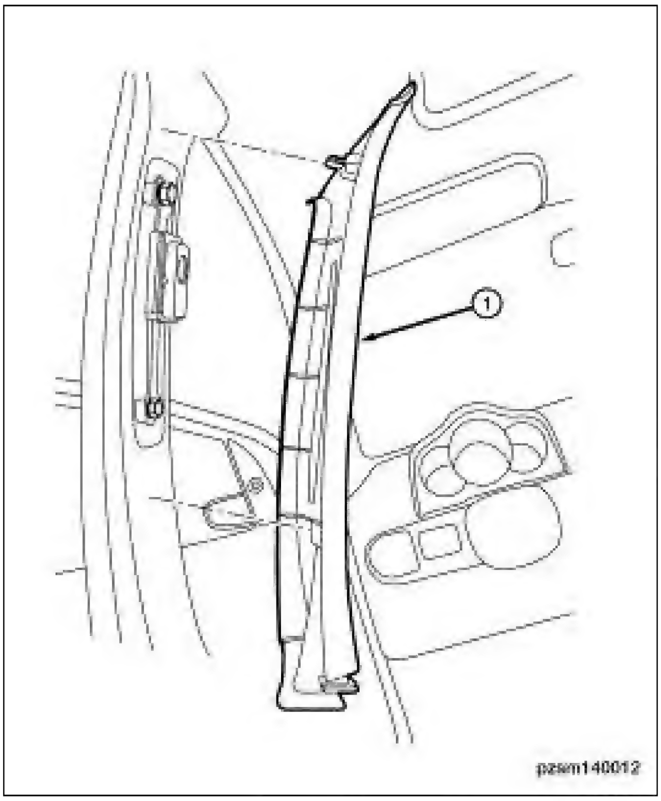
3. Using a trim stick, pry the B-pillar trim panel (1) to release the retaining clips.



4. Remove the front seat belt bracket retaining screws (1).


1
pzsm140017

5. Using a trim stick, remove B-pillar upper trim panel (1).

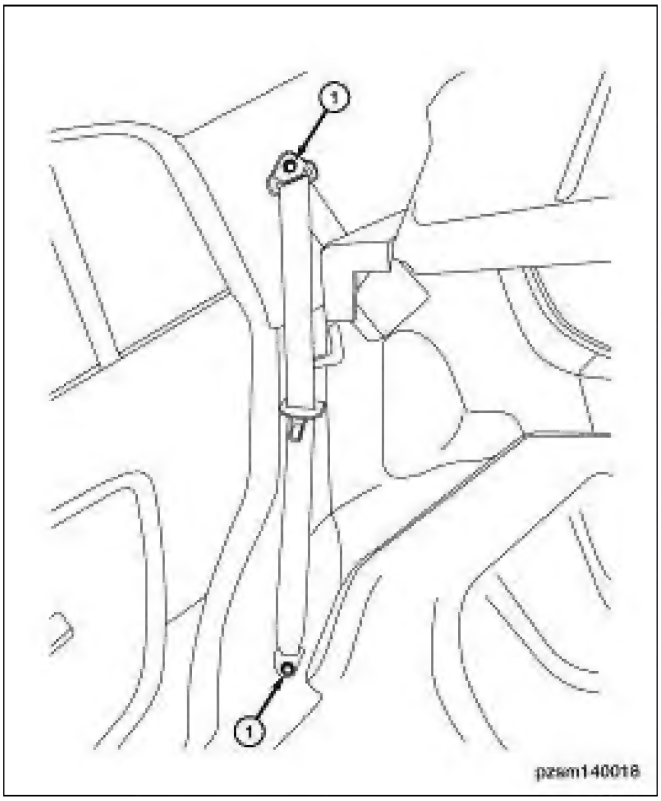

1
pzsm140012

6. Installation is in the reverse order of removal.

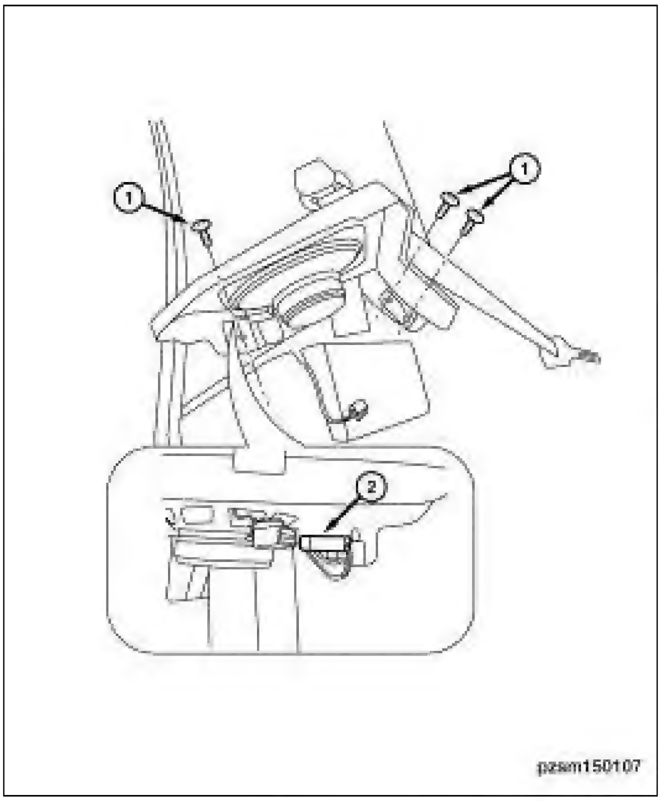
C-Pillar Trim Panel

Removal & Installation

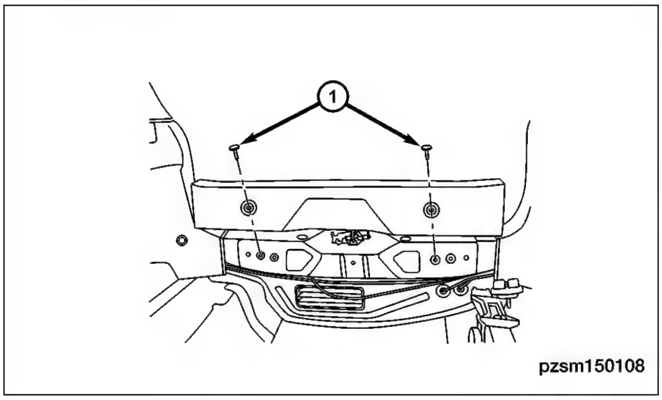
1. Remove the two side seat belt mounting bolts (1).


1
1
pzsm140018

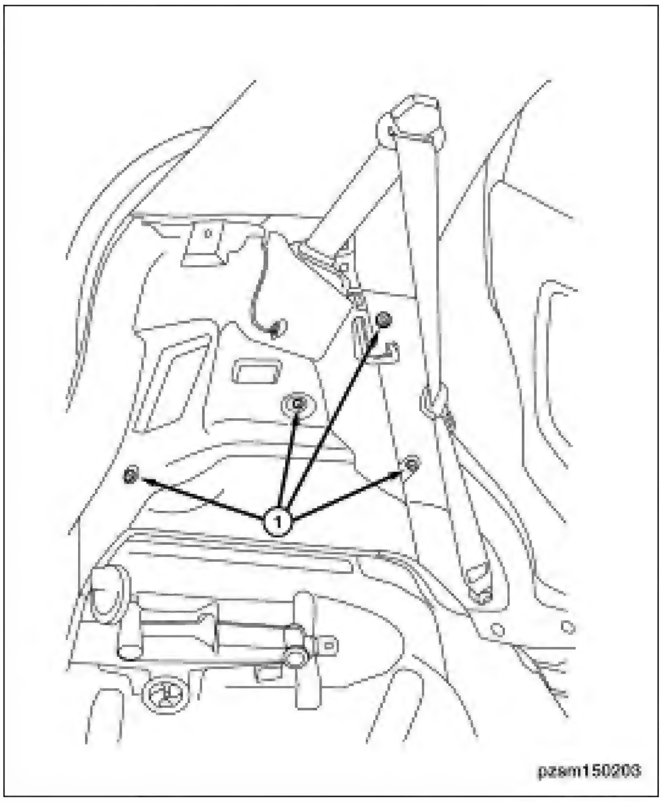
2. Disconnect the rear speaker electrical connector (2).
3. Remove the three rear speaker retaining screws (1).


1
1
2
pzsm150107

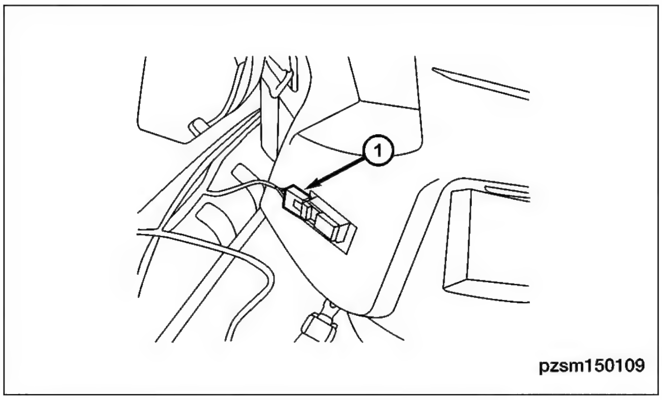
4. Remove the rear speaker.
5. Remove the two rear hatch kick plate retaining clips (1).


1
pzsm150108

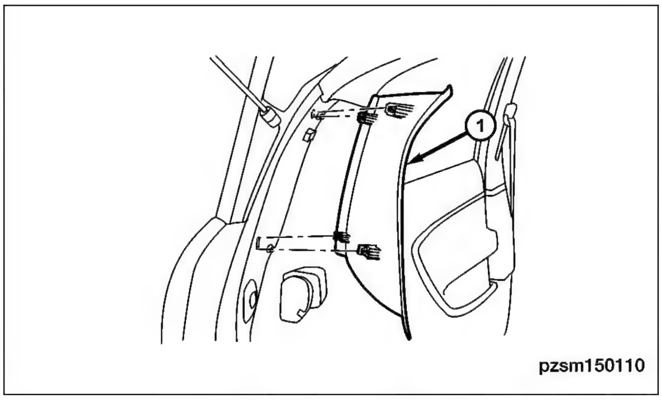
6. Remove the two rear hatch kick plates.
7. Remove the C-pillar lower trim panel retaining clips (1).


1
pzsm150203

8. Remove the C-pillar lower trim panel and disconnect the rear hatch lamp electrical connector (1).


1
pzsm150109

9. Using a trim stick, remove the C-pillar upper trim panel (1).

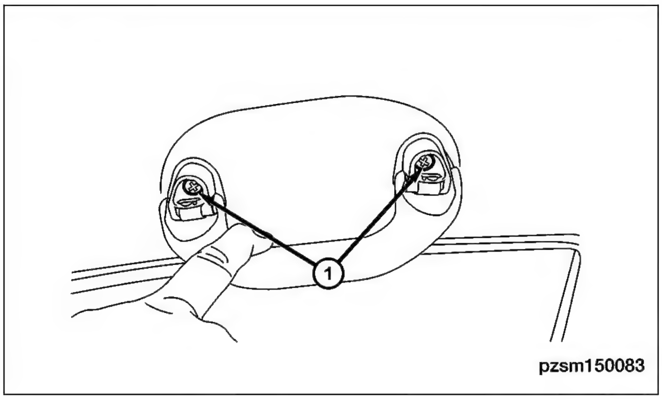


10. Installation is in the reverse order of removal.

Passenger Grab Handle

Removal & Installation

1. Remove the grab handle bolt trim covers.
2. Remove the two grab handle bolts (1).

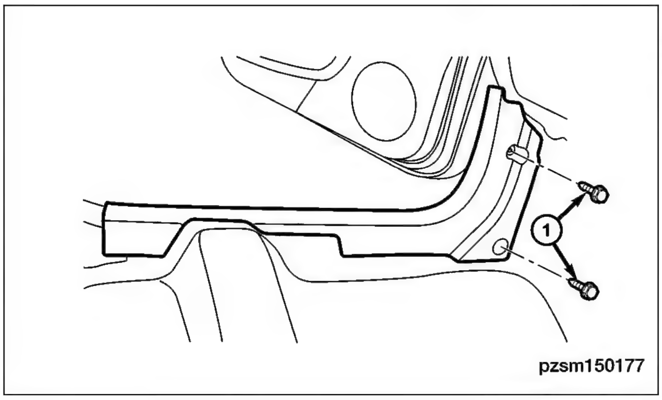


3. Remove the passenger grab handle.
4. Installation is in the reverse order of removal.

Scuff Plate

Removal & Installation

1. Remove the two scuff plate retaining screws (1).
2. Grasp the scuff plate and gently pull it away to release the retaining clips.
3. Using a trim stick, remove the scuff plate from the front door sill.

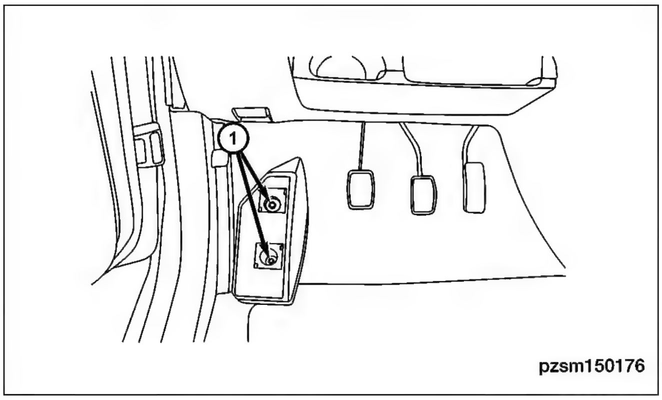


4. Installation is in the reverse order of removal.

Pedal Pad

Removal & Installation

1. Remove the pedal pad bolt covers.
2. Remove the pedal pad retaining bolts (1).
   (Tighten: Pedal pad bolts to 8 ± 1 N·m)



3. Remove the pedal pad.
4. Installation is in the reverse order of removal.

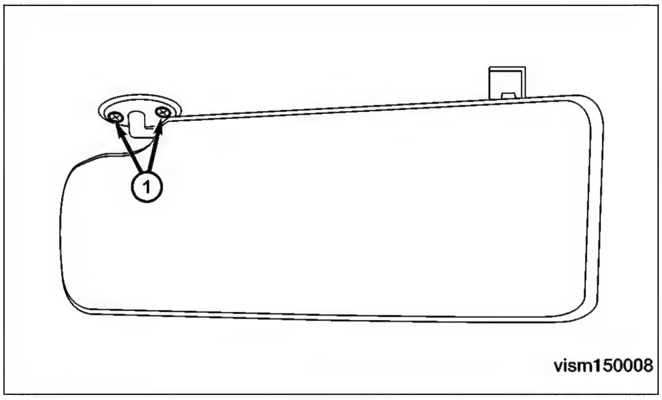
Sun Visor

Removal & Installation

1. Disconnect the sun visor from the retaining clip.
2. Remove the mounting screws (1) on the sun visor hinge.
3. Remove the sun visor assembly.
4. Installation is in the reverse order of removal.

Installation Notes:

- Do not overtighten the sun visor mounting screws. Tighten the sun visor mounting screws at the sun visor hinge just enough to allow for free movement of the sun visor.

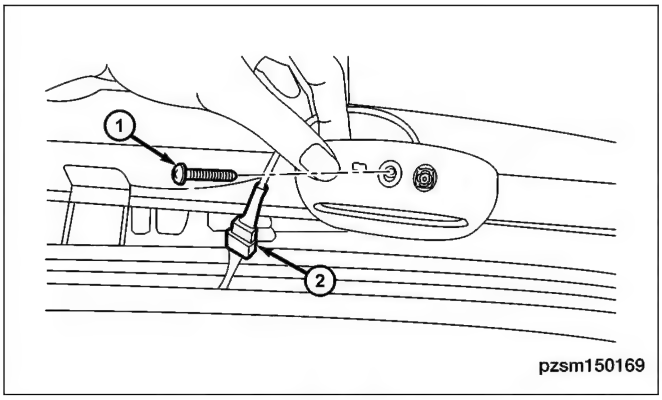


Headliner

Removal & Installation

1. Remove the passenger grab handle (See Passenger Grab Handle Removal & Installation in Section 15 Body & Accessories).
2. Remove the front dome lamp (See Front Dome Lamp Removal & Installation in Section 15 Body & Accessories).
3. Remove the A/B/C pillar (See A/B/C Pillar Removal & Installation in Section 15 Body & Accessories).
4. Remove the left and right sun visor (See Sun Visor Removal & Installation in Section 15 Body & Accessories).

5. Remove the reversing display retaining screw (1) and disconnect the display electrical connector (2).



6. Remove the headliner.
7. Installation is in the reverse order of removal.

Installation Notes:

- The front edge of the headliner should fit tight to the roof and not interfere with the view of the front windshield.
- The headliner corners should fit tight to the roof and not be visible outside the car.
- The headliner should fit tight with the weatherstrip around the door openings and the luggage compartment.
- The headliner should fit tight to the roof around the arcs of the upper trim panels (A, B, and C pillars) with a clearance less than 0.2 mm.

CAN VEHICLE COMMUNICATIONS

Description

The Controller Area Network (CAN) is only available on vehicles equipped with the Automated Manual Transaxle (AMT). CAN vehicle communication is a multiplex communication system. This enables the system to transmit and receive large quantities of data at high speed by connecting various vehicle modules with two communication lines (CAN-H and CAN-L). CAN vehicle communication consists of the following:

- Diagnostic Connector
- Instrument Cluster
- Automated Manual Transaxle (AMT) Control Module

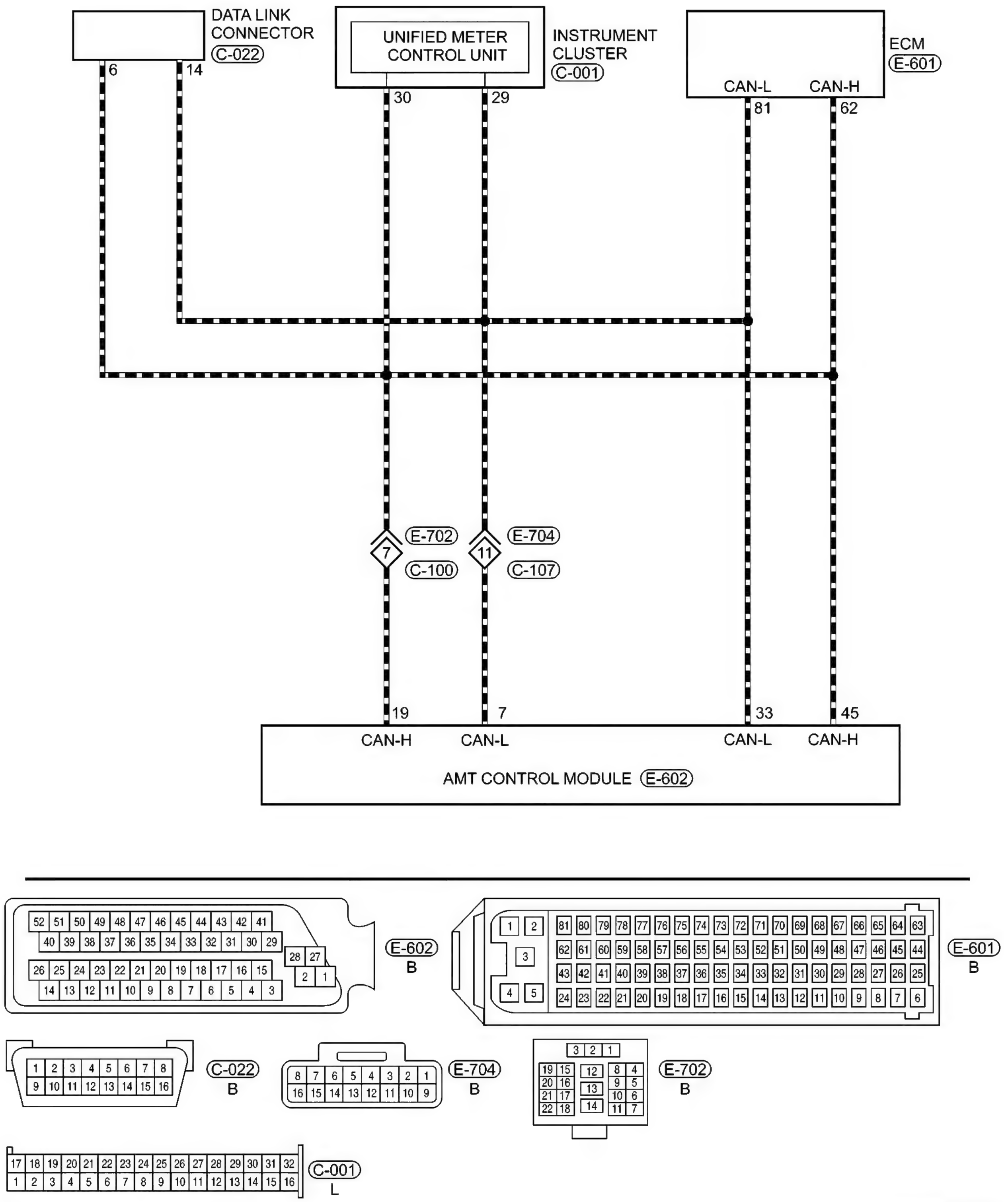
Operation

Control modules on the Controller Area Network (CAN) network transmit signals using the CAN communication control circuit. Data exchange between modules is achieved by serial transmission of encoded data over the CAN network. The CAN data bus messages are carried over the bus in the form of variable pulse width modulated signals. The CAN bus uses low and high voltage levels to generate signals. The voltage on the bus varies between zero and two and one-half volts. The low and high voltage levels are generated by means of variable-pulse width modulation to form signals of varying length.

Electrical Schematics

CAN Vehicle Communications (Page 1 of 1)

CAN SYSTEM


DATA LINK CONNECTOR
C-022
6
14
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
30
29
ECM
E-601
CAN-L
CAN-H
81
62
E-702
7
C-100
E-704
11
C-107
19
7
33
45
CAN-H
CAN-L
CAN-L
CAN-H
AMT CONTROL MODULE
E-602
E-602
B
E-601
B
C-022
B
E-704
B
E-702
B
C-001
L

pzsmw151010t

CHIME

Description

The chime is located in the Instrument Cluster (IC). The chime warning system is an audible notification to the driver. The chime warning system is designed to alert the driver of a vehicle problem or condition.

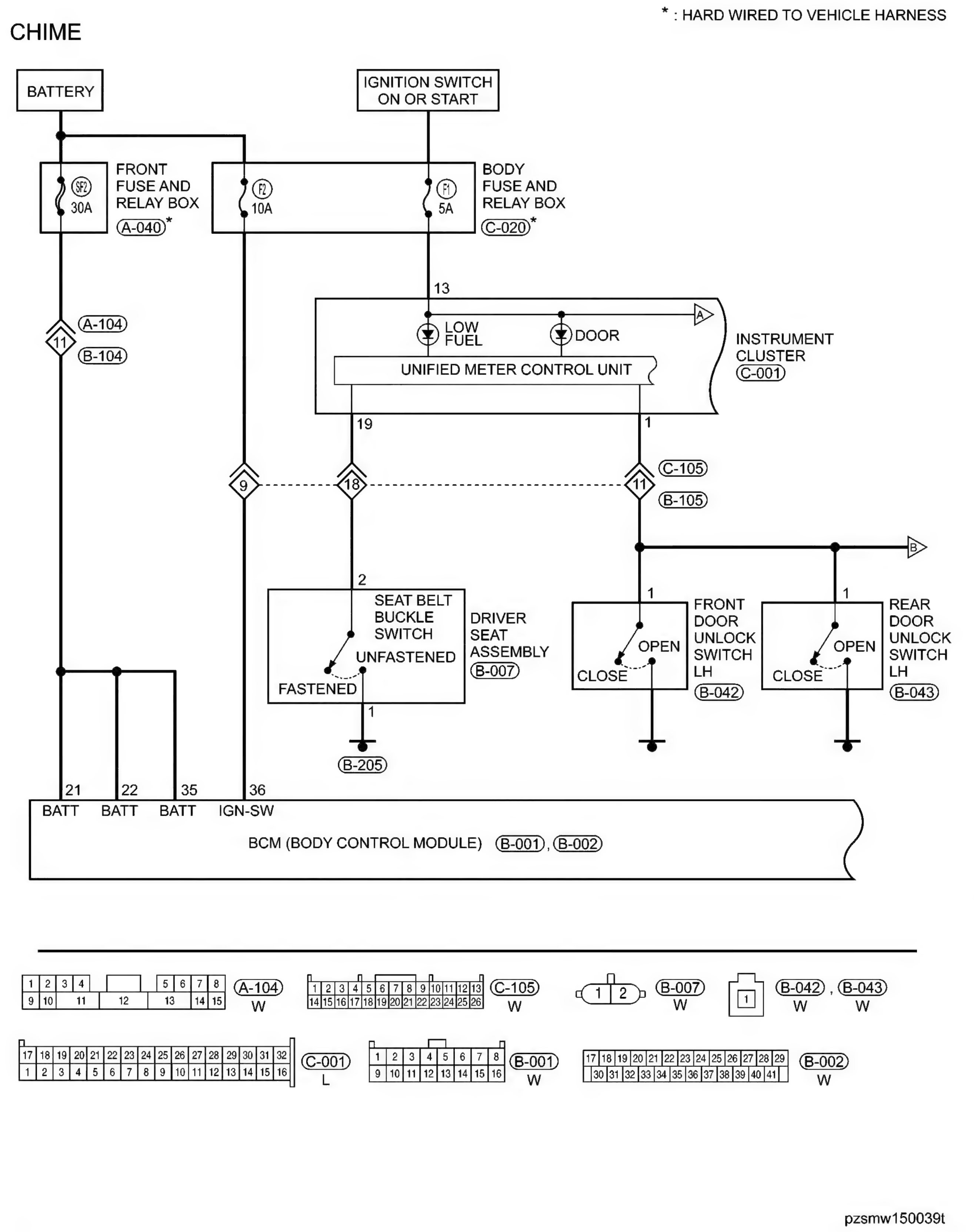
Operation

The Instrument Cluster (IC) uses hard wired inputs from various sensors and switches to activate the chime. The sensors and switches are located throughout the vehicle. The following conditions will cause the chime to operate:

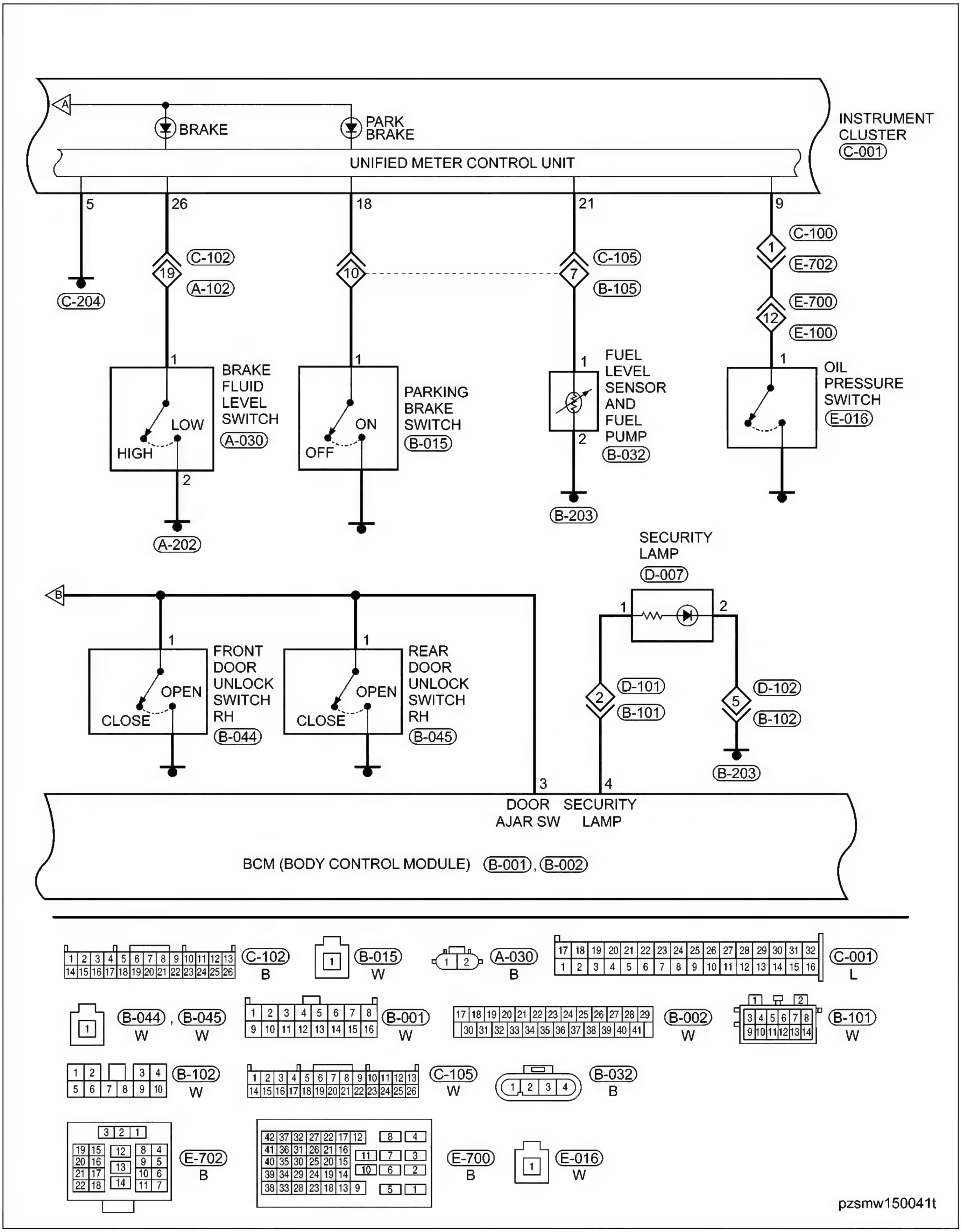
- Turn signal on
- Hazard warning flashers on
- Seat belt unbuckled
- Low fuel level
- Low oil pressure
- Low brake fluid level
- Doors unlocked
- Charging system fault
- Engine performance fault
- Airbag system fault
- Low coolant level
- Immobilizer control module fault
- Engine overheating

Electrical Schematics

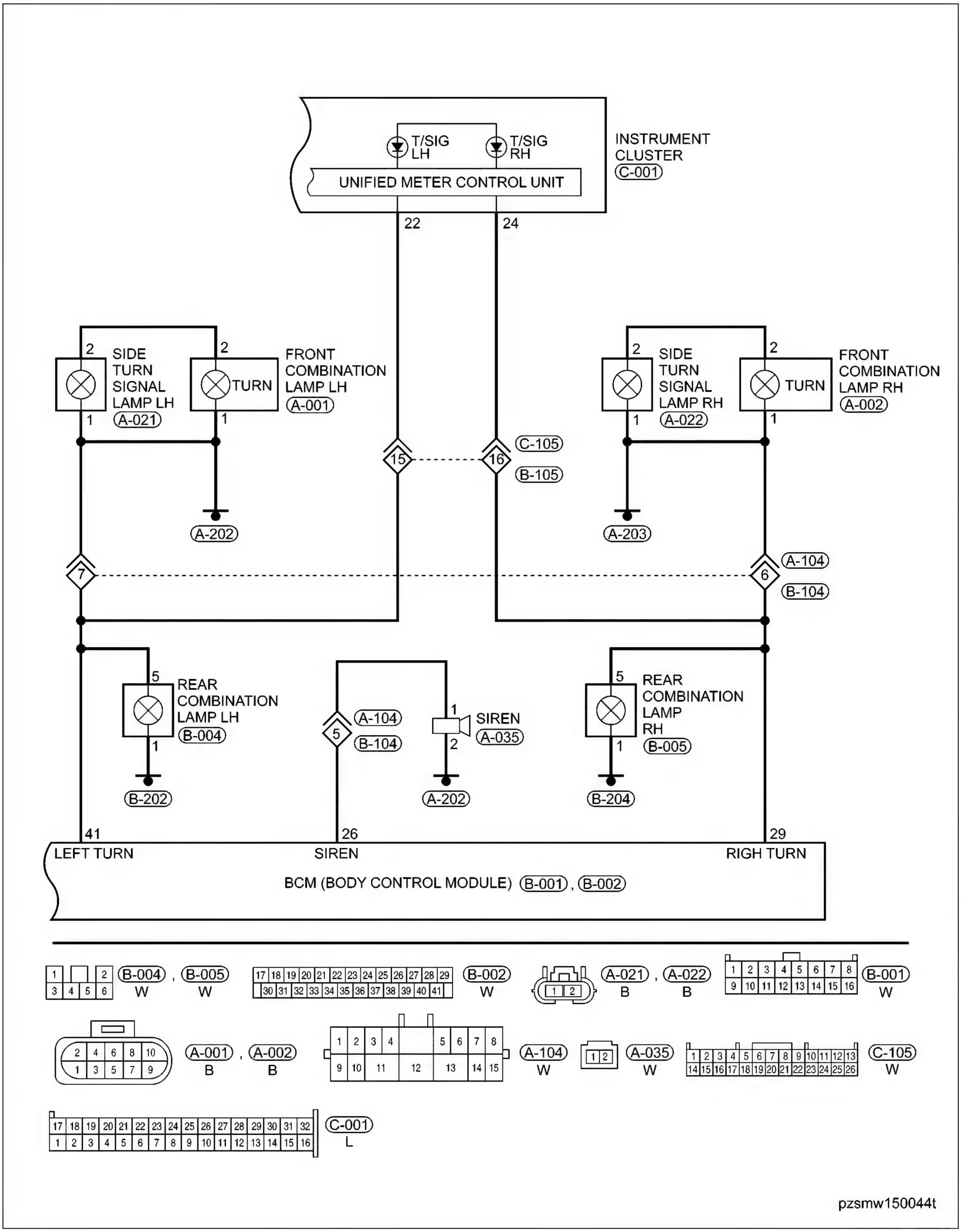
Chime (Page 1 of 3)


* : HARD WIRED TO VEHICLE HARNESS
CHIME
BATTERY
IGNITION SWITCH ON OR START
SF2 30A
FRONT FUSE AND RELAY BOX
A-040*
F2 10A
F1 5A
BODY FUSE AND RELAY BOX
C-020*
13
LOW FUEL
DOOR
A
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
19
1
A-104
11
B-104
9
18
11
C-105
B-105
B
2
SEAT BELT BUCKLE SWITCH
UNFASTENED
FASTENED
DRIVER SEAT ASSEMBLY
B-007
1
B-205
1
OPEN
CLOSE
FRONT DOOR UNLOCK SWITCH LH
B-042
1
OPEN
CLOSE
REAR DOOR UNLOCK SWITCH LH
B-043
21
22
35
36
BATT
BATT
BATT
IGN-SW
BCM (BODY CONTROL MODULE) B-001, B-002
A-104 W
C-105 W
B-007 W
B-042, B-043 W W
C-001 L
B-001 W
B-002 W
pzsmw150039t

Chime (Page 2 of 3)


A
BRAKE
PARK BRAKE
INSTRUMENT CLUSTER
C-001
UNIFIED METER CONTROL UNIT
5
26
18
21
9
C-102
19
A-102
10
C-105
7
B-105
C-100
1
E-702
E-700
12
E-100
C-204
1
BRAKE FLUID LEVEL SWITCH
A-030
LOW
HIGH
2
A-202
1
PARKING BRAKE SWITCH
B-015
ON
OFF
1
FUEL LEVEL SENSOR AND FUEL PUMP
B-032
2
B-203
1
OIL PRESSURE SWITCH
E-016
SECURITY LAMP
D-007
B
1
2
1
FRONT DOOR UNLOCK SWITCH RH
B-044
OPEN
CLOSE
1
REAR DOOR UNLOCK SWITCH RH
B-045
OPEN
CLOSE
2
D-101
B-101
5
D-102
B-102
B-203
3
4
DOOR AJAR SW
SECURITY LAMP
BCM (BODY CONTROL MODULE) B-001, B-002
C-102 B
B-015 W
A-030 B
C-001 L
B-044, B-045 W W
B-001 W
B-002 W
B-101 W
B-102 W
C-105 W
B-032 B
E-702 B
E-700 B
E-016 W
pzsmw150041t

Chime (Page 3 of 3)


T/SIG LH
T/SIG RH
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
22
24
2
SIDE TURN SIGNAL LAMP LH
A-021
1
2
TURN
FRONT COMBINATION LAMP LH
A-001
1
15
16
C-105
B-105
A-202
2
SIDE TURN SIGNAL LAMP RH
A-022
1
2
TURN
FRONT COMBINATION LAMP RH
A-002
1
A-203
7
6
A-104
B-104
5
REAR COMBINATION LAMP LH
B-004
1
B-202
5
A-104
B-104
1
SIREN
A-035
2
A-202
5
REAR COMBINATION LAMP RH
B-005
1
B-204
41
LEFT TURN
26
SIREN
29
RIGH TURN
BCM (BODY CONTROL MODULE) B-001, B-002
B-004, B-005
W W
B-002
W
A-021, A-022
B B
B-001
W
A-001, A-002
B B
A-104
W
A-035
W
C-105
W
C-001
L
pzsmw150044t

15

DOOR LOCKS

Description

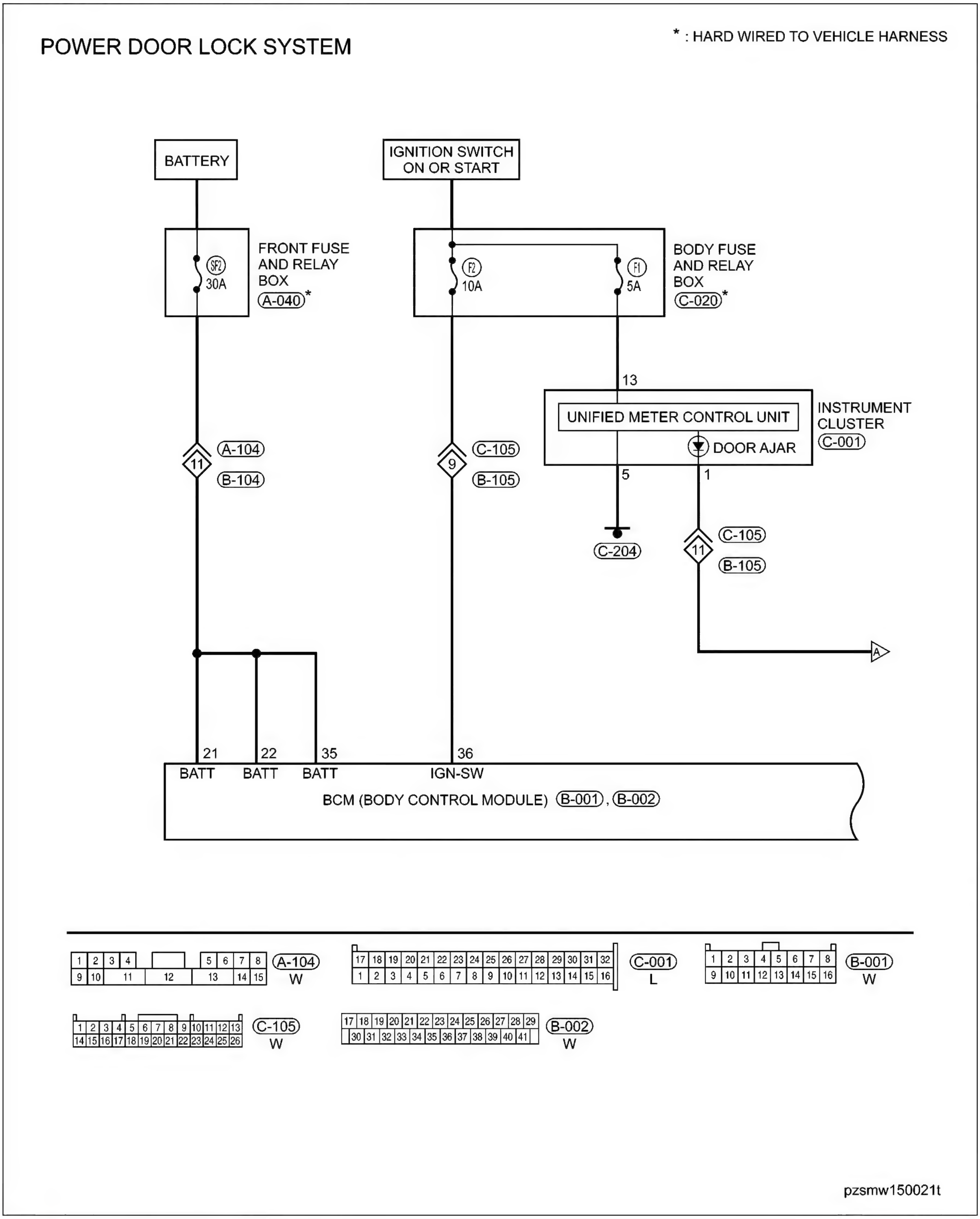
The power door locks allow the doors to be locked or unlocked electronically. The power door lock switch is located on the front door trim panel. The power door locks can also be operated by the Remote Keyless Entry (RKE) transmitter.

Operation

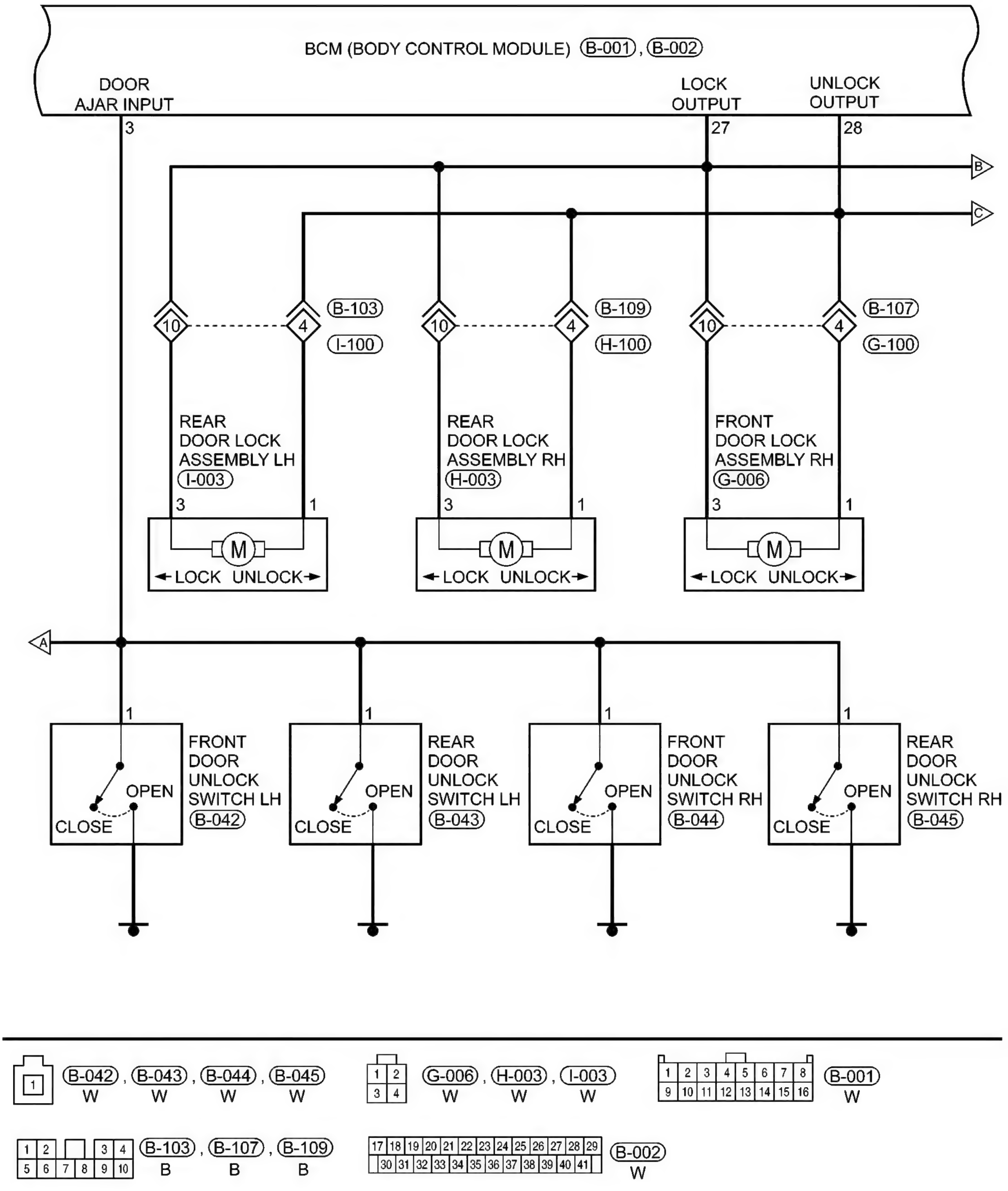
The power lock system receives non-switched battery current, so that the power locks remain operational, regardless of the ignition switch position.

Electrical Schematics

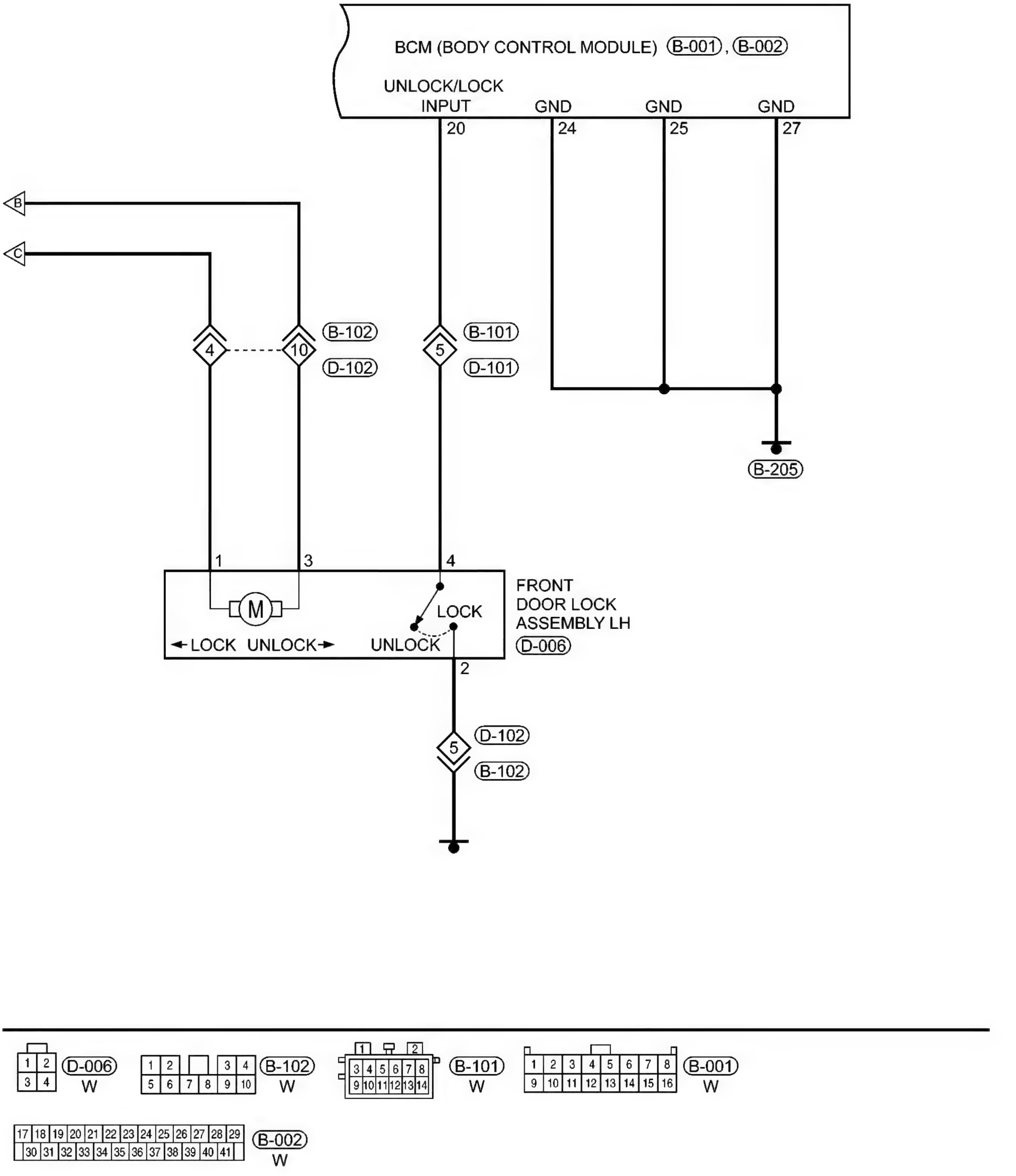
Power Door Lock System (Page 1 of 3)


POWER DOOR LOCK SYSTEM
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
SF2 30A
FRONT FUSE AND RELAY BOX
A-040*
F2 10A
F1 5A
BODY FUSE AND RELAY BOX
C-020*
13
UNIFIED METER CONTROL UNIT
DOOR AJAR
INSTRUMENT CLUSTER
C-001
5
1
A-104
11
B-104
C-105
9
B-105
C-204
C-105
11
B-105
A
21
22
35
36
BATT
BATT
BATT
IGN-SW
BCM (BODY CONTROL MODULE) B-001, B-002
A-104 W
C-001 L
B-001 W
C-105 W
B-002 W
pzsmw150021t

Power Door Lock System (Page 2 of 3)


BCM (BODY CONTROL MODULE) (B-001), (B-002)
DOOR AJAR INPUT
3
LOCK OUTPUT
27
UNLOCK OUTPUT
28
B
C
10
4
(B-103)
(I-100)
(B-109)
(H-100)
(B-107)
(G-100)
REAR DOOR LOCK ASSEMBLY LH (I-003)
REAR DOOR LOCK ASSEMBLY RH (H-003)
FRONT DOOR LOCK ASSEMBLY RH (G-006)
3
1
M
LOCK
UNLOCK
A
1
OPEN
CLOSE
FRONT DOOR UNLOCK SWITCH LH (B-042)
REAR DOOR UNLOCK SWITCH LH (B-043)
FRONT DOOR UNLOCK SWITCH RH (B-044)
REAR DOOR UNLOCK SWITCH RH (B-045)
(B-042), (B-043), (B-044), (B-045)
W W W W
(G-006), (H-003), (I-003)
W W W
(B-001)
W
(B-103), (B-107), (B-109)
B B B
(B-002)
W
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
pzsmw150022t

Power Door Lock System (Page 3 of 3)

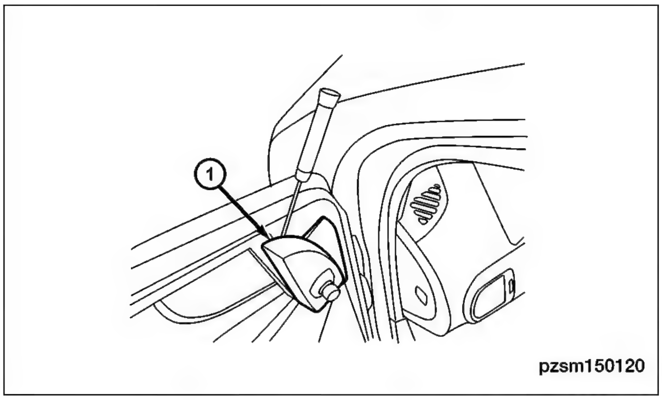

BCM (BODY CONTROL MODULE) B-001, B-002
UNLOCK/LOCK INPUT
GND
GND
GND
20
24
25
27
B
C
4
10
B-102
D-102
5
B-101
D-101
B-205
1
3
4
M
LOCK
◄LOCK UNLOCK►
UNLOCK
FRONT DOOR LOCK ASSEMBLY LH
D-006
2
5
D-102
B-102
1 2 3 4
D-006
W
1 2 3 4 5 6 7 8 9 10
B-102
W
1 2 3 4 5 6 7 8 9 10 11 12 13 14
B-101
W
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
B-001
W
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
B-002
W

pzsmw150023t

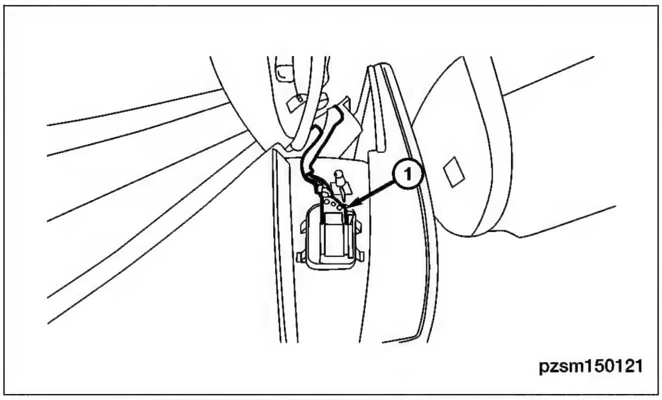
Power Lock Motor

Removal & Installation

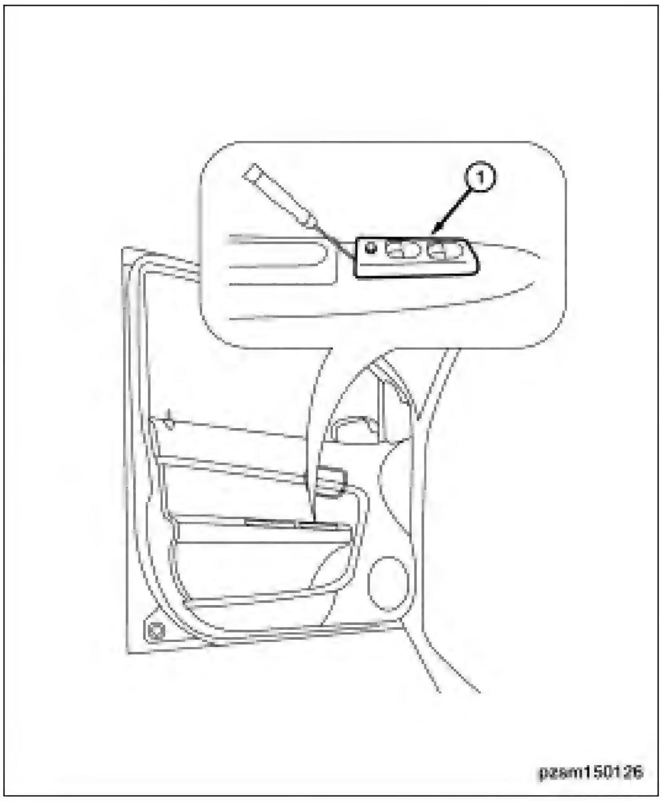
1. Turn the ignition switch off.
2. Using a trim stick, remove the outside mirror switch panel (1) from the door trim panel.



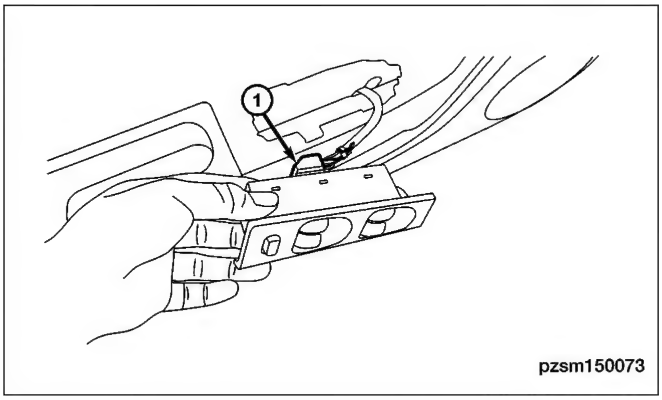
3. Disconnect the outside mirror switch electrical connector (1).



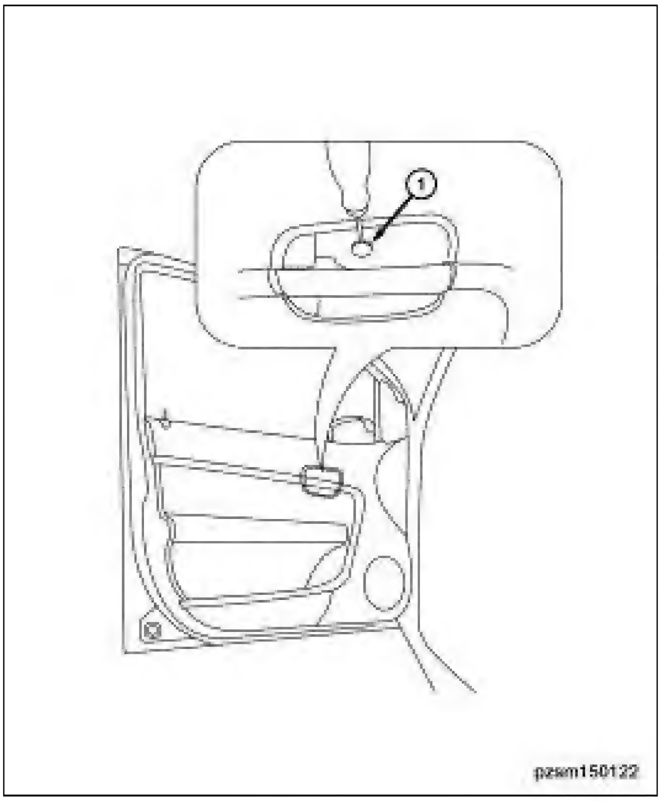
4. Using a trim stick, remove the power window switch assembly (1).


1
pzsm150126

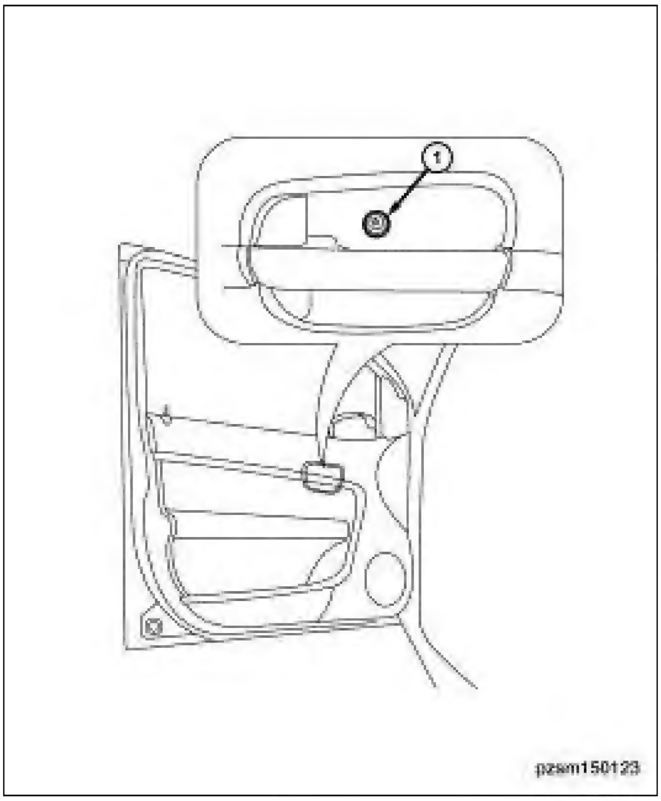
5. Disconnect the power window switch electrical connector (1).


1
pzsm150073

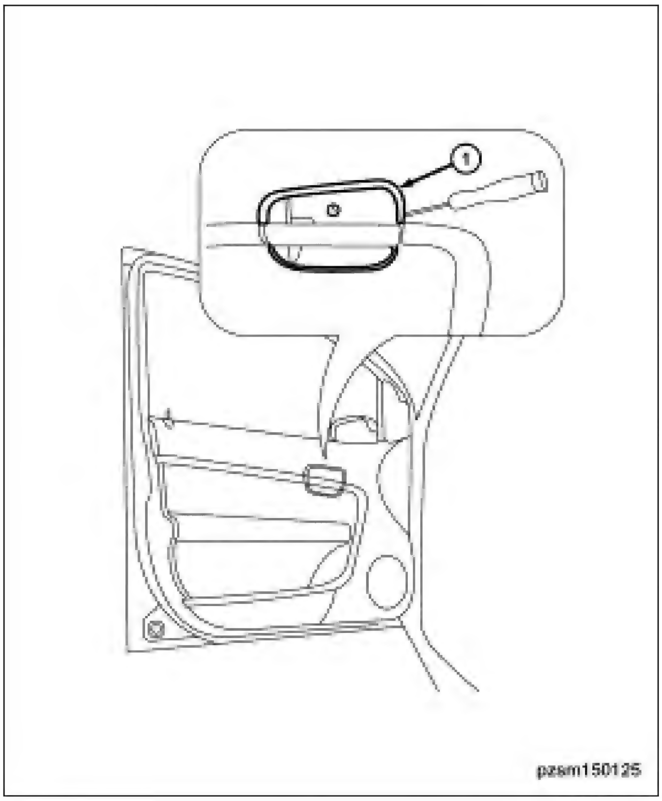
6. Using a trim stick, remove the inside door handle panel retaining screw cover (1).


1
pzsm150122

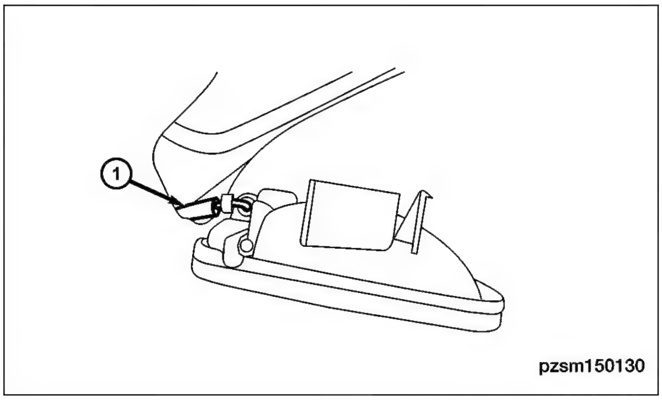
7. Remove the inside door handle panel retaining screw (1).


1
pzsm150123

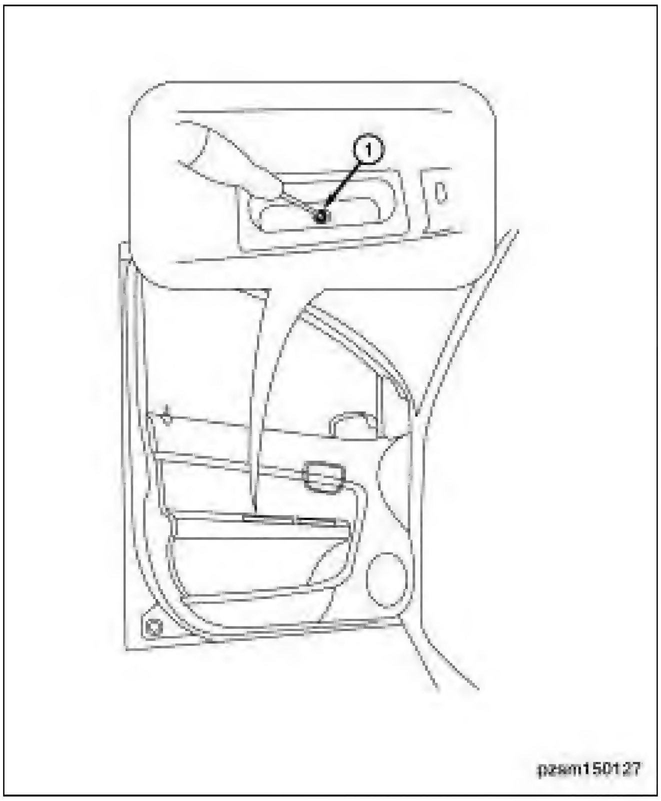
8. Using a trim stick, remove the inside door handle panel (1).


1
pzsm150125

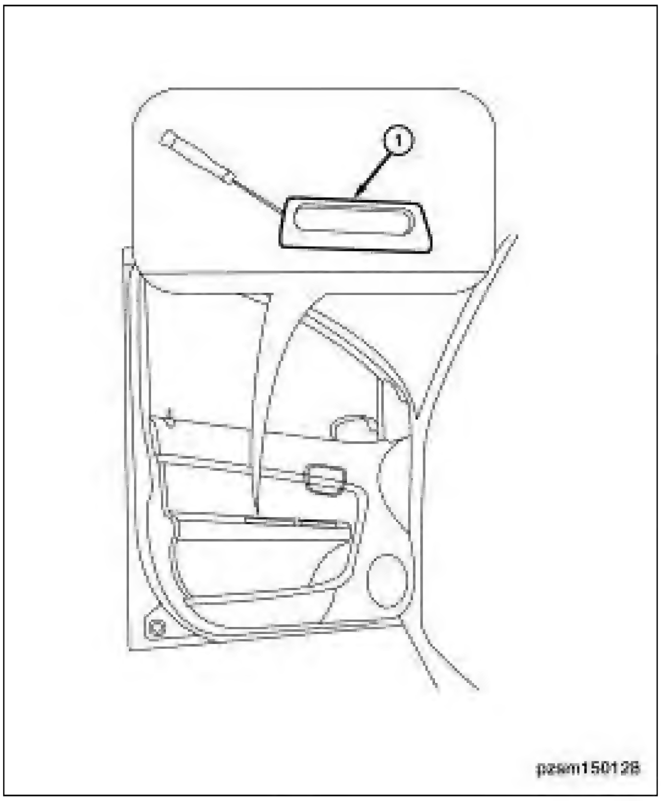
9. Loosen the inside door handle panel control cable (1).


1
pzsm150130

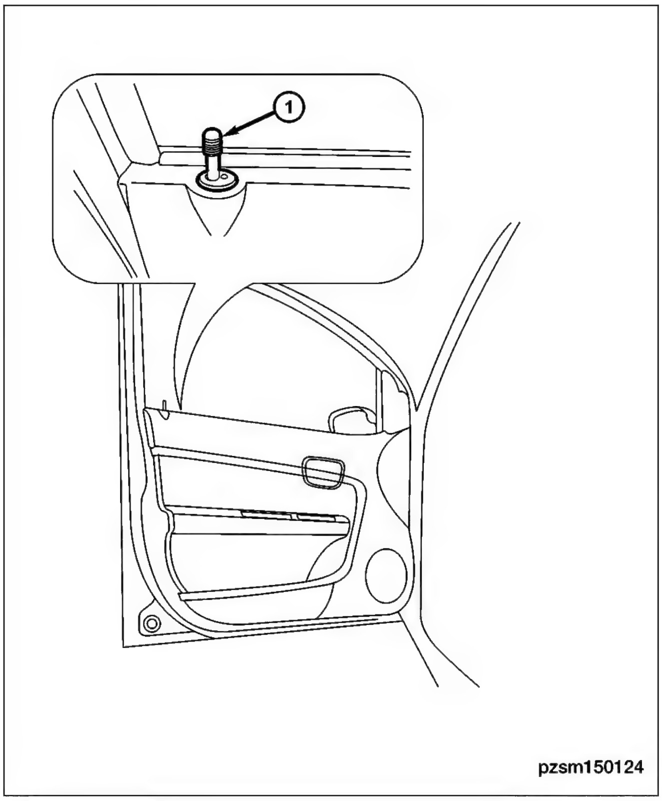
10. Remove the small storage compartment retaining screw (1) on the door trim panel.


1
pzsm150127

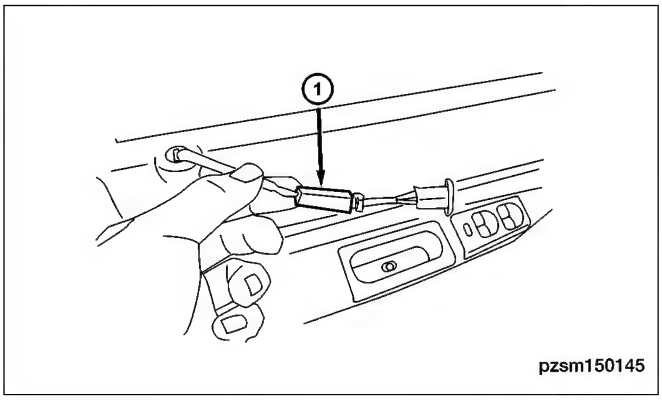
11. Using a trim stick, remove the small storage compartment (1).


1
pzsm150128

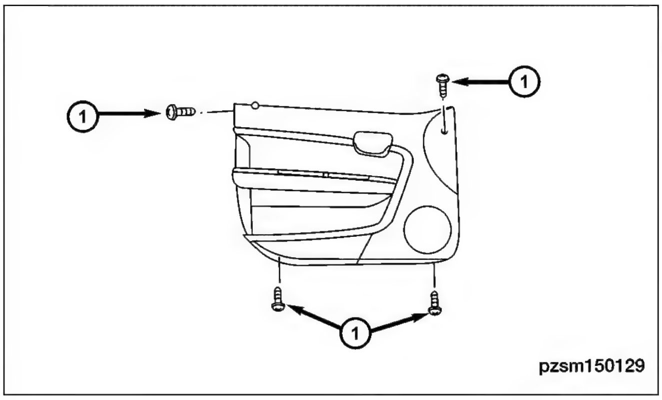
12. Remove the door switch (1).


1
pzsm150124

13. Disconnect the door switch electrical connector (1).

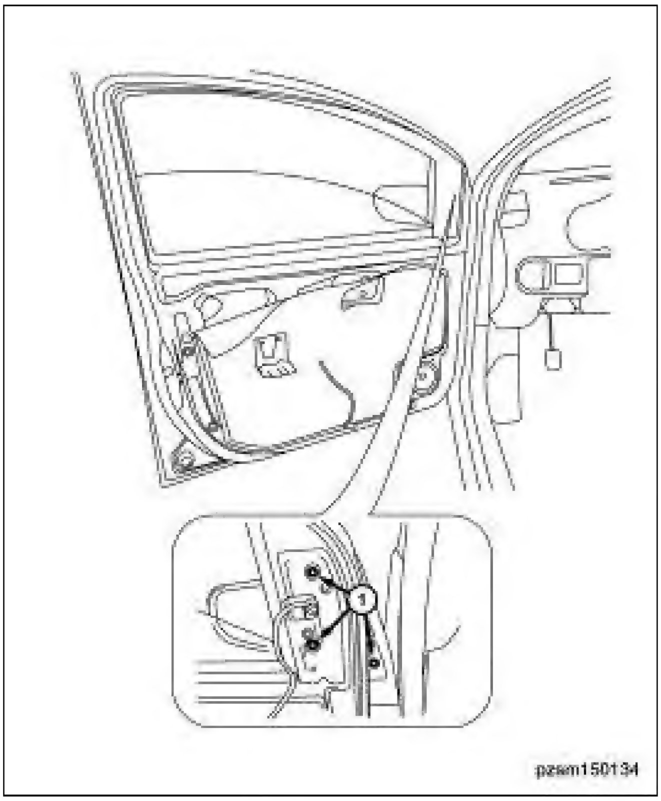

1
pzsm150145

14. Remove the four retaining screws (1) from the door trim panel.

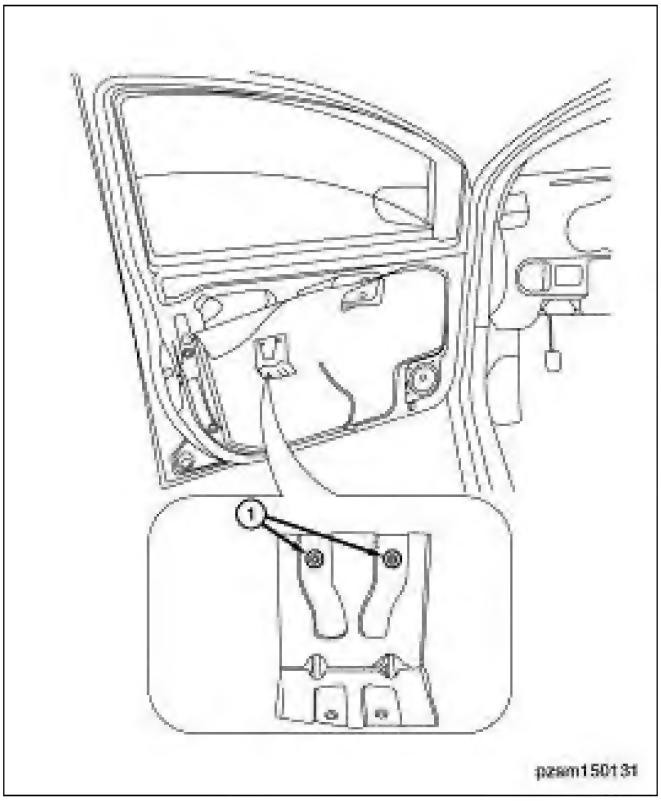

1
1
1
pzsm150129

15. Remove the door trim panel.

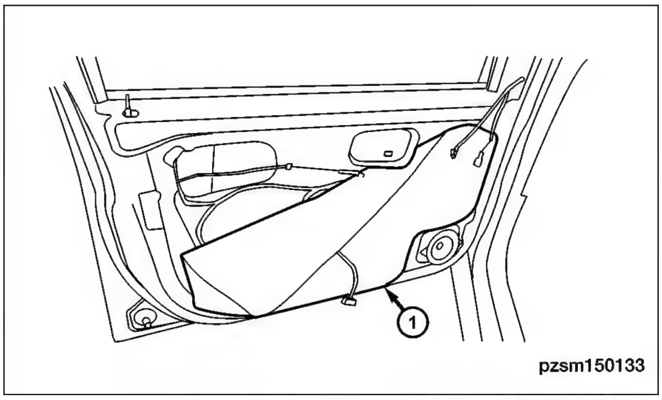
16. Remove the outside mirror retaining nuts (1), and remove the outside mirror electrical connector. (Tighten: Outside mirror mounting nuts to 7 ± 1 N·m)



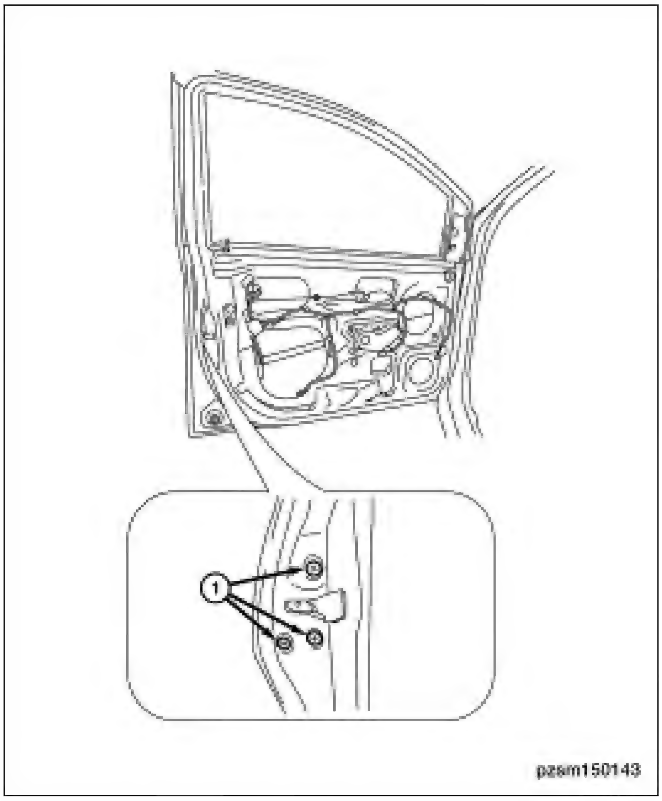
17. Remove the two door trim panel mounting bracket retaining screws (1).



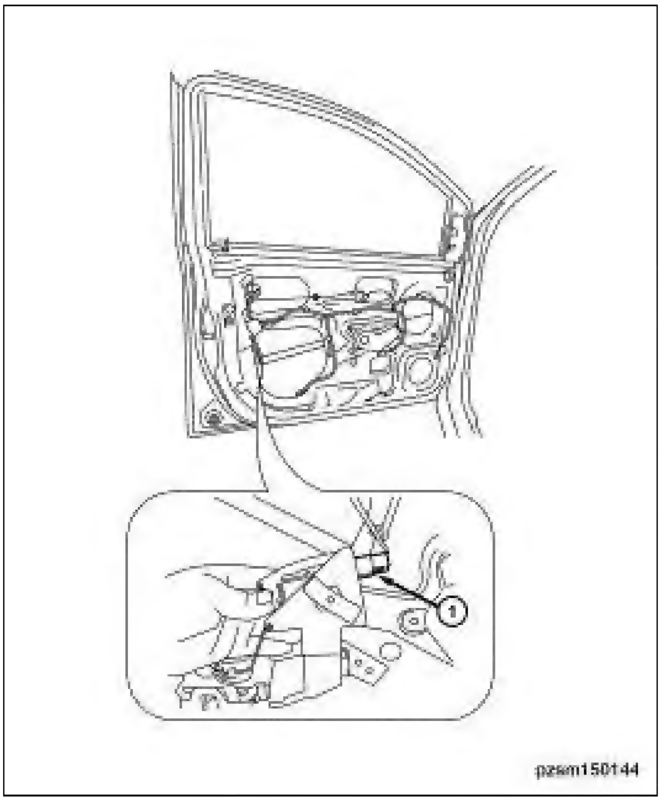
18. Remove the protective film (1) from the front door.


1
pzsm150133

19. Remove the power lock motor retaining screws (1). (Tighten: Power lock motor retaining screws to 8 ± 1 N·m)


1
pzsm150143

20. Disconnect the power lock motor electrical connector (1).



21. Disconnect the door lock motor connecting rod to the outside door handle.
22. Remove the power door lock motor.
23. Remove the power door lock motor connectors and tie rods.

Door Lock Assembly Inspection

1. Using the following table, apply battery voltage to the specified connector terminals.
2. Verify that the door lock assembly locks and unlocks when voltage is applied to the specific terminals.
3. If the test results are not as specified, replace the motor.

MEASURING CONDITION	OPERATION
Battery positive (+) to terminal – 1 Battery negative (-) to terminal – 3	Lock
Battery positive (+) to terminal – 3 Battery negative (-) to terminal – 1	Unlock

BODY CONTROL MODULE - BCM

Description

The Body Control Module (BCM) is located under the driver seat. The BCM controls many electrical components and systems for the vehicle electrical system. The BCM is the primary hub that controls functions such as internal and external lighting, power windows and power door locks.

Operation

The Body Control Module (BCM) uses hard wired inputs from various sensors and switches. The sensors and switches are located throughout the vehicle.

The following components are inputs to the BCM:

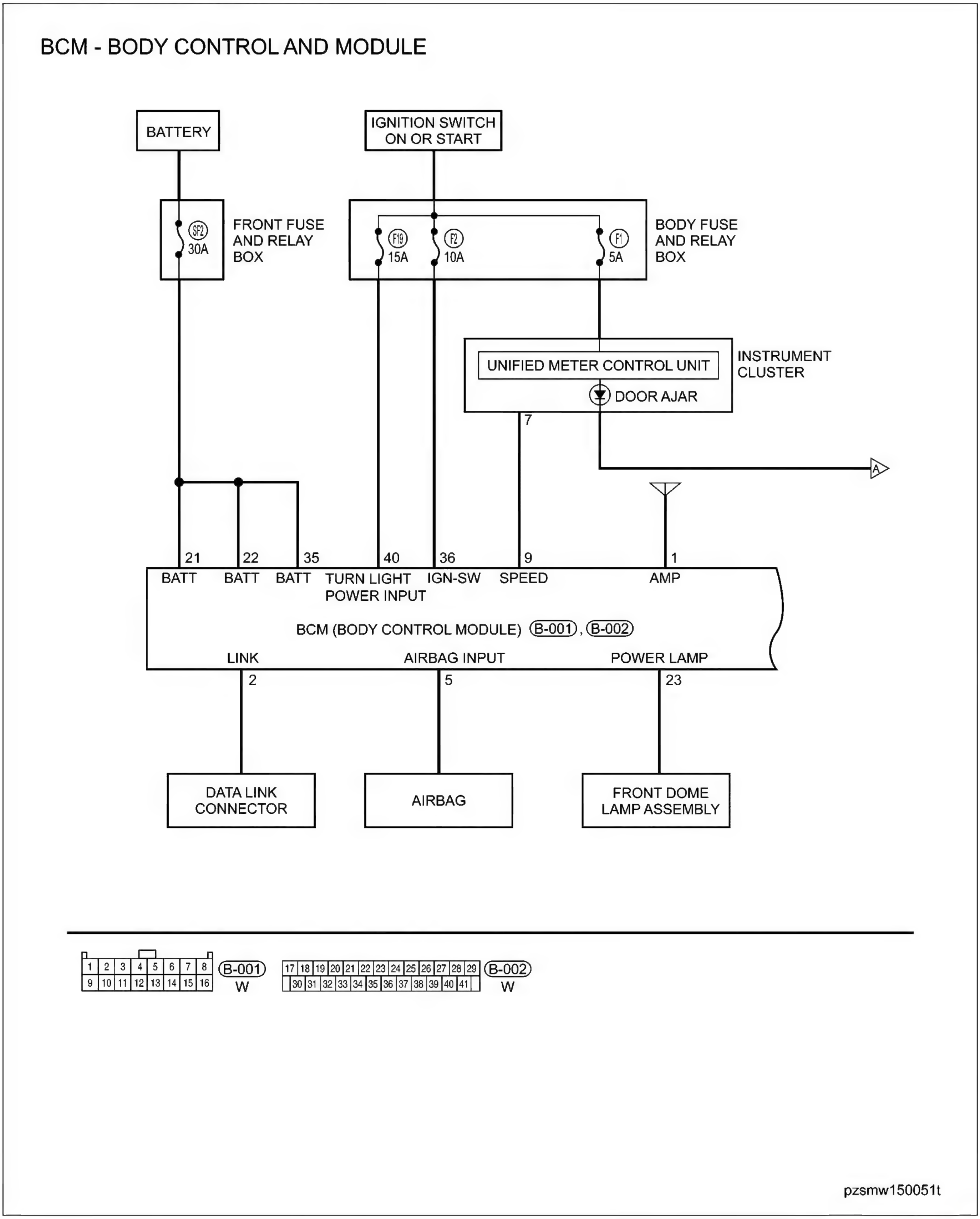
- Key switch
- Rear window defogger switch
- Hazard lamp switch
- Front power window switches
- Power door lock switches
- Door ajar switches
- Front fog lamp switch
- Backup lamp switch
- Backlight switch
- Horn switch
- Lighting and turn signal switch
- Outside mirror switch
- Hood switch
- Wiper and washer switch

The following components are outputs from the BCM:

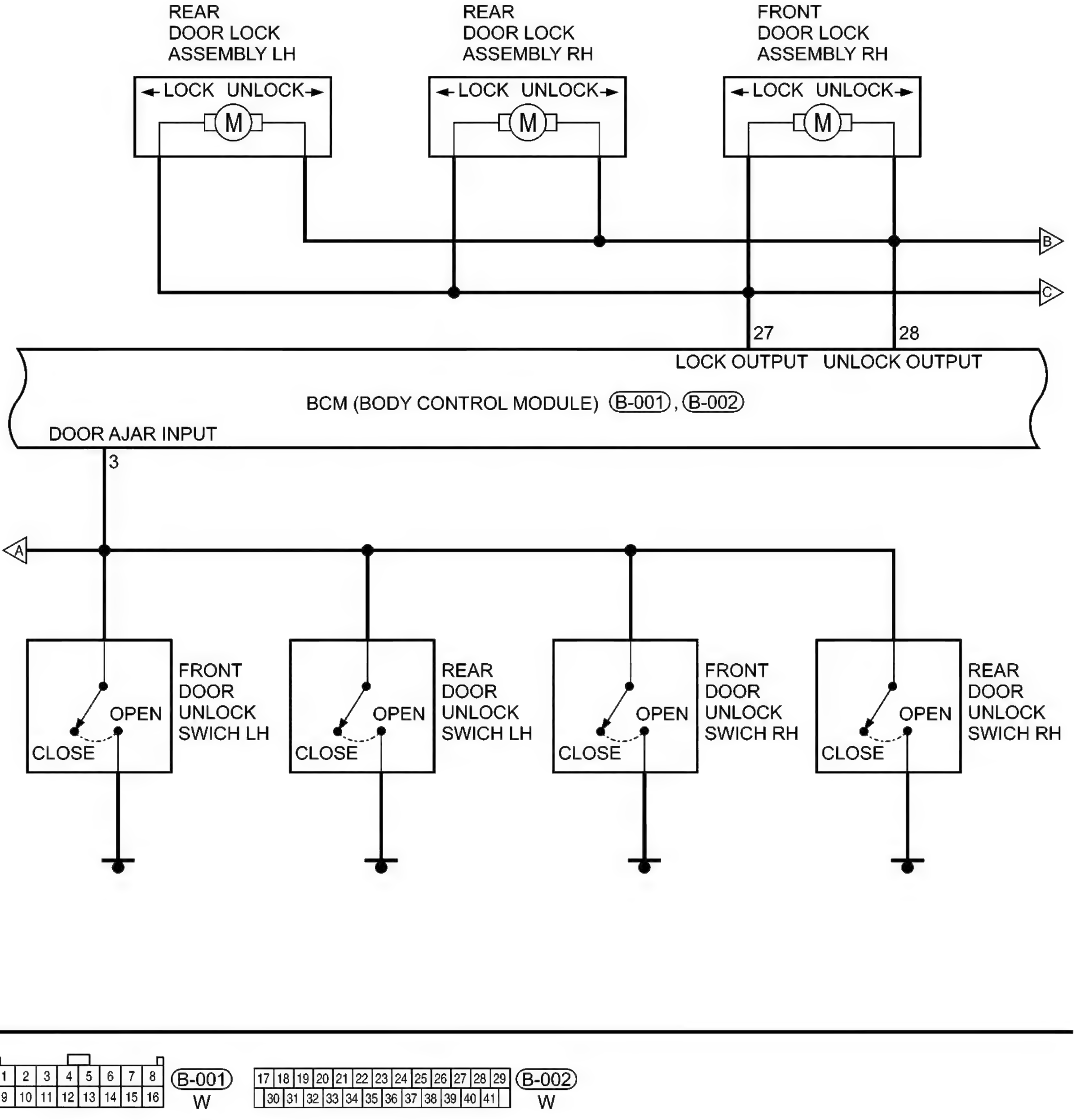
- Key lamp
- High/low beam relay
- Rear defogger grid
- Front combination lamps
- Rear combination lamps
- Dome lamps
- Turn signal lamps
- Security lamp
- Step lamps
- Front power window motor
- Power door lock motor
- Washer motor
- Wiper motor

Electrical Schematics

Body Control Module (Page 1 of 4)

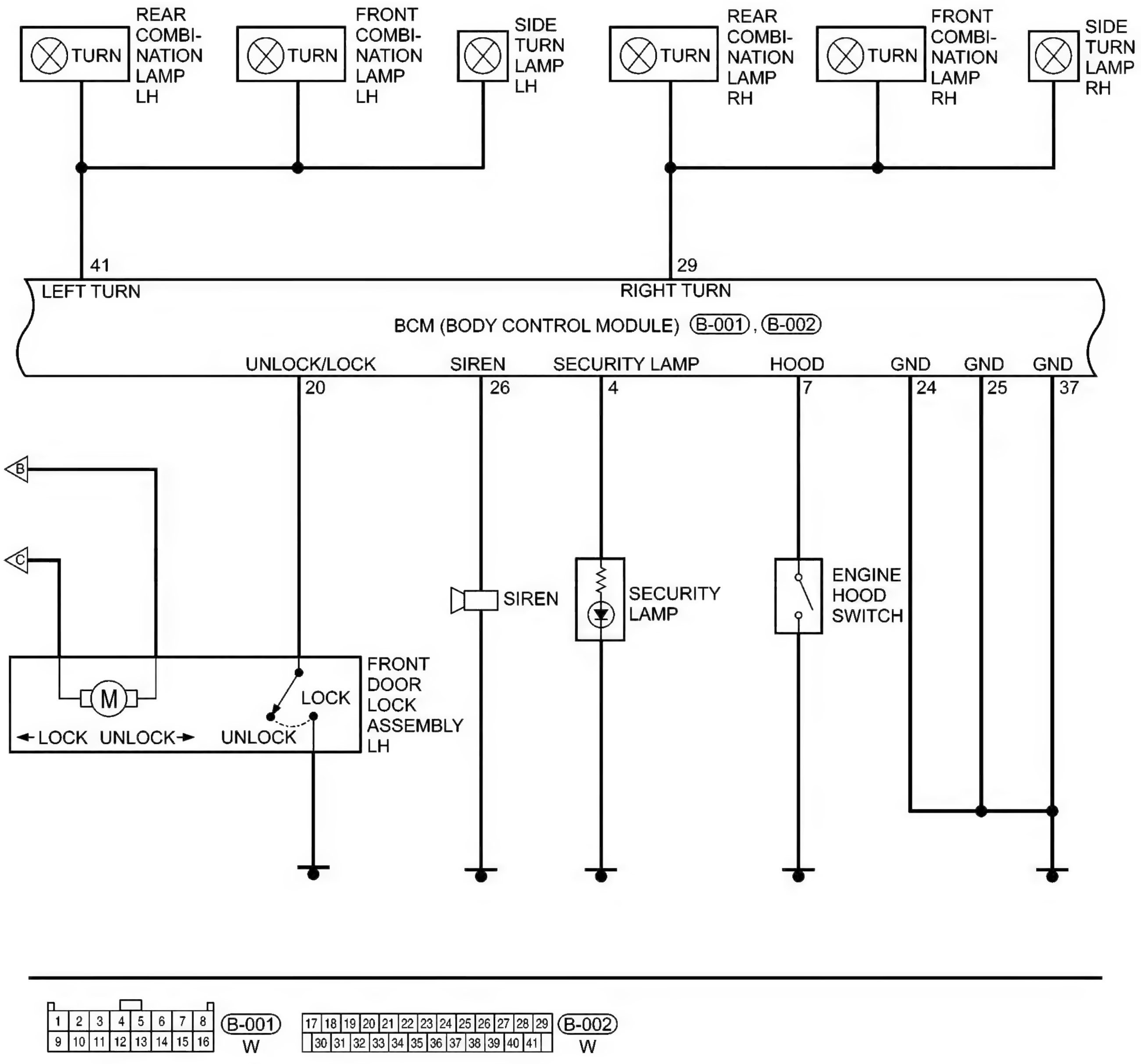

BCM - BODY CONTROL AND MODULE
BATTERY
IGNITION SWITCH ON OR START
SF2
30A
FRONT FUSE AND RELAY BOX
F19
15A
F2
10A
F1
5A
BODY FUSE AND RELAY BOX
UNIFIED METER CONTROL UNIT
DOOR AJAR
INSTRUMENT CLUSTER
7
A
21
22
35
40
36
9
1
BATT
BATT
BATT
TURN LIGHT POWER INPUT
IGN-SW
SPEED
AMP
BCM (BODY CONTROL MODULE) B-001, B-002
LINK
AIRBAG INPUT
POWER LAMP
2
5
23
DATA LINK CONNECTOR
AIRBAG
FRONT DOME LAMP ASSEMBLY
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B-001
W
17 18 19 20 21 22 23 24 25 26 27 28 29
30 31 32 33 34 35 36 37 38 39 40 41
B-002
W
pzsmw150051t

Body Control Module (Page 2 of 4)


REAR DOOR LOCK ASSEMBLY LH
REAR DOOR LOCK ASSEMBLY RH
FRONT DOOR LOCK ASSEMBLY RH
LOCK
UNLOCK
M
B
C
27
28
LOCK OUTPUT
UNLOCK OUTPUT
BCM (BODY CONTROL MODULE) B-001, B-002
DOOR AJAR INPUT
3
A
FRONT DOOR UNLOCK SWICH LH
REAR DOOR UNLOCK SWICH LH
FRONT DOOR UNLOCK SWICH RH
REAR DOOR UNLOCK SWICH RH
OPEN
CLOSE
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B-001
W
17 18 19 20 21 22 23 24 25 26 27 28 29
30 31 32 33 34 35 36 37 38 39 40 41
B-002
W

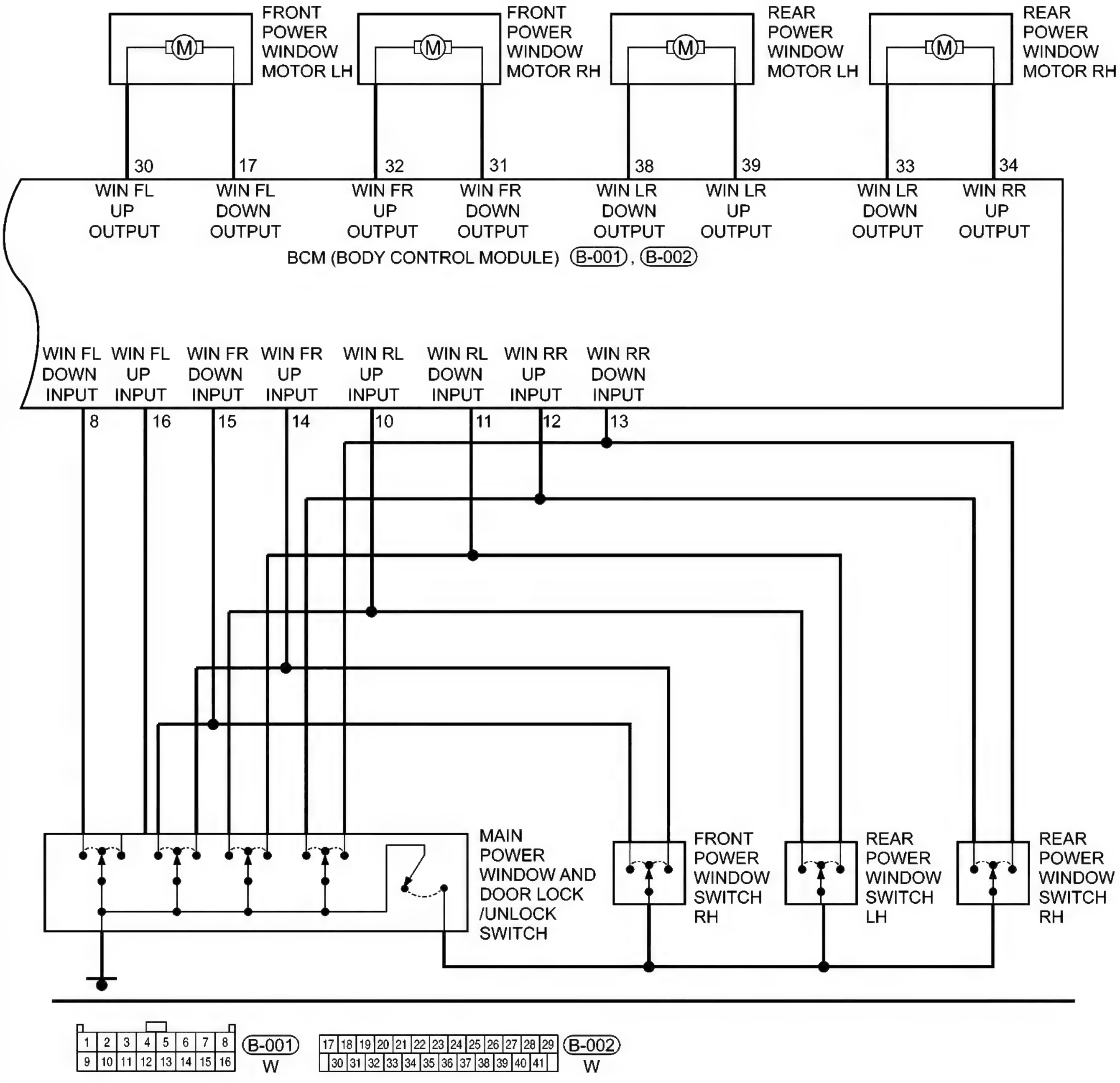
pzsmw150052t

Body Control Module (Page 3 of 4)


TURN
REAR COMBI-NATION LAMP LH
TURN
FRONT COMBI-NATION LAMP LH
SIDE TURN LAMP LH
TURN
REAR COMBI-NATION LAMP RH
TURN
FRONT COMBI-NATION LAMP RH
SIDE TURN LAMP RH
41
LEFT TURN
29
RIGHT TURN
BCM (BODY CONTROL MODULE) B-001 , B-002
UNLOCK/LOCK
20
SIREN
26
SECURITY LAMP
4
HOOD
7
GND
24
GND
25
GND
37
B
C
M
LOCK
UNLOCK
LOCK
UNLOCK
FRONT DOOR LOCK ASSEMBLY LH
SIREN
SECURITY LAMP
ENGINE HOOD SWITCH
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B-001
W
17 18 19 20 21 22 23 24 25 26 27 28 29
30 31 32 33 34 35 36 37 38 39 40 41
B-002
W

pzsmw150053t

Body Control Module (Page 4 of 4)


FRONT POWER WINDOW MOTOR LH
FRONT POWER WINDOW MOTOR RH
REAR POWER WINDOW MOTOR LH
REAR POWER WINDOW MOTOR RH
M
30
17
32
31
38
39
33
34
WIN FL UP OUTPUT
WIN FL DOWN OUTPUT
WIN FR UP OUTPUT
WIN FR DOWN OUTPUT
WIN LR DOWN OUTPUT
WIN LR UP OUTPUT
WIN LR DOWN OUTPUT
WIN RR UP OUTPUT
BCM (BODY CONTROL MODULE) B-001, B-002
WIN FL DOWN INPUT
WIN FL UP INPUT
WIN FR DOWN INPUT
WIN FR UP INPUT
WIN RL UP INPUT
WIN RL DOWN INPUT
WIN RR UP INPUT
WIN RR DOWN INPUT
8
16
15
14
10
11
12
13
MAIN POWER WINDOW AND DOOR LOCK /UNLOCK SWITCH
FRONT POWER WINDOW SWITCH RH
REAR POWER WINDOW SWITCH LH
REAR POWER WINDOW SWITCH RH
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B-001
W
17 18 19 20 21 22 23 24 25 26 27 28 29
30 31 32 33 34 35 36 37 38 39 40 41
B-002
W

pzsmw150055t

Body Control Module (BCM) Connector Pin-Out Table

PIN	CIRCUIT IDENTIFICATION	PIN	CIRCUIT IDENTIFICATION
1	Antenna	22	Continuous Supply Voltage
2	Link	23	Dome Lamp Output
3	Door Ajar Input	24	GND
4	Security Lamp Output	25	GND
5	Airbag Input	26	Siren Output
6	-	27	Lock Output
7	Hood Input	28	Unlock Output
8	Left Front Window - Down Input	29	Right Turn Signal Output
9	-	30	Left Front Window Down Output
10	Left Rear Window Up Input	31	Right Front Window Up Output
11	Left Rear Window Down Input	32	Right Front Window Down Output
12	Right Rear Window Up Input	33	Right Rear Window Up Output
13	Left Front Window Down Input	34	Right Rear Window Down Output
14	Right Front Window Up Input	35	Continuous Supply Voltage
15	Left Front Window Down Input	36	IGN Input
16	Left Front Window Up Input	37	GND
17	Left Front Window Up Input	38	Left Rear Window Up Output
18	Start Input	39	Left Rear Window Down Output
19	-	40	Turn Signal Light Power Input
20	Unlock/Lock Input	41	Left Turn Signal Output
21	Continuous Supply Voltage	-	-

DIAGNOSIS & TESTING

Diagnostic Help

1. The X-431 scan tool connects to the Data Link Connector (DLC) and communicates with the vehicle electronic modules through the K data circuit.
2. Confirm that the malfunction is current and carry-out the diagnostic tests and repair procedures.
3. If the DTC cannot be deleted, it is a current fault.
4. Use a digital multimeter to perform voltage readings on electronic systems.
5. Refer to Technical Bulletins that have been issued.
6. Visually inspect the related electrical wiring harness.
7. Inspect and clean all BCM grounds that are related to the DTC.
8. If numerous trouble codes were set, use the electrical schematic and look for any common ground circuits or voltage supply circuits that may apply to the DTC.

Intermittent DTC Troubleshooting

If the failure is intermittent perform the following:
- Check for loose connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Monitor the scan tool data relative to this circuit.
- Wiggle the related electrical wiring harness and connectors while looking for an interrupted signal on the affected circuit.
- If possible, try to duplicate the conditions under which the DTC set.
- Look for the data to change or for the DTC to reset during the wiggle test.
- Look for broken, bent, pushed out or corroded terminals.
- Inspect the sensor and mounting area for any condition that would result in an incorrect signal, such as damage or foreign material.
- A data recorder, and/or oscilloscope should be used to help diagnose intermittent conditions.
- Remove the BCM module from the troubled vehicle and install in a new vehicle and test. If the DTC cannot be deleted, the BCM module is malfunctioning. If the DTC can be deleted, return the BCM module to the original vehicle.

Ground Inspection

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This added resistance can alter the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can effect the circuit. Perform the following when inspecting a ground connection:

1. Remove the ground bolt or screw.
2. Inspect all mating surface for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for ″add-on″ accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are crimped to one eyelet, make sure no excess wire insulation has been crimped creating a bad ground.

15

Diagnostic Tools

- Diagnostic Scan Tool X-431
- Digital Multimeter
- Jumper Wire

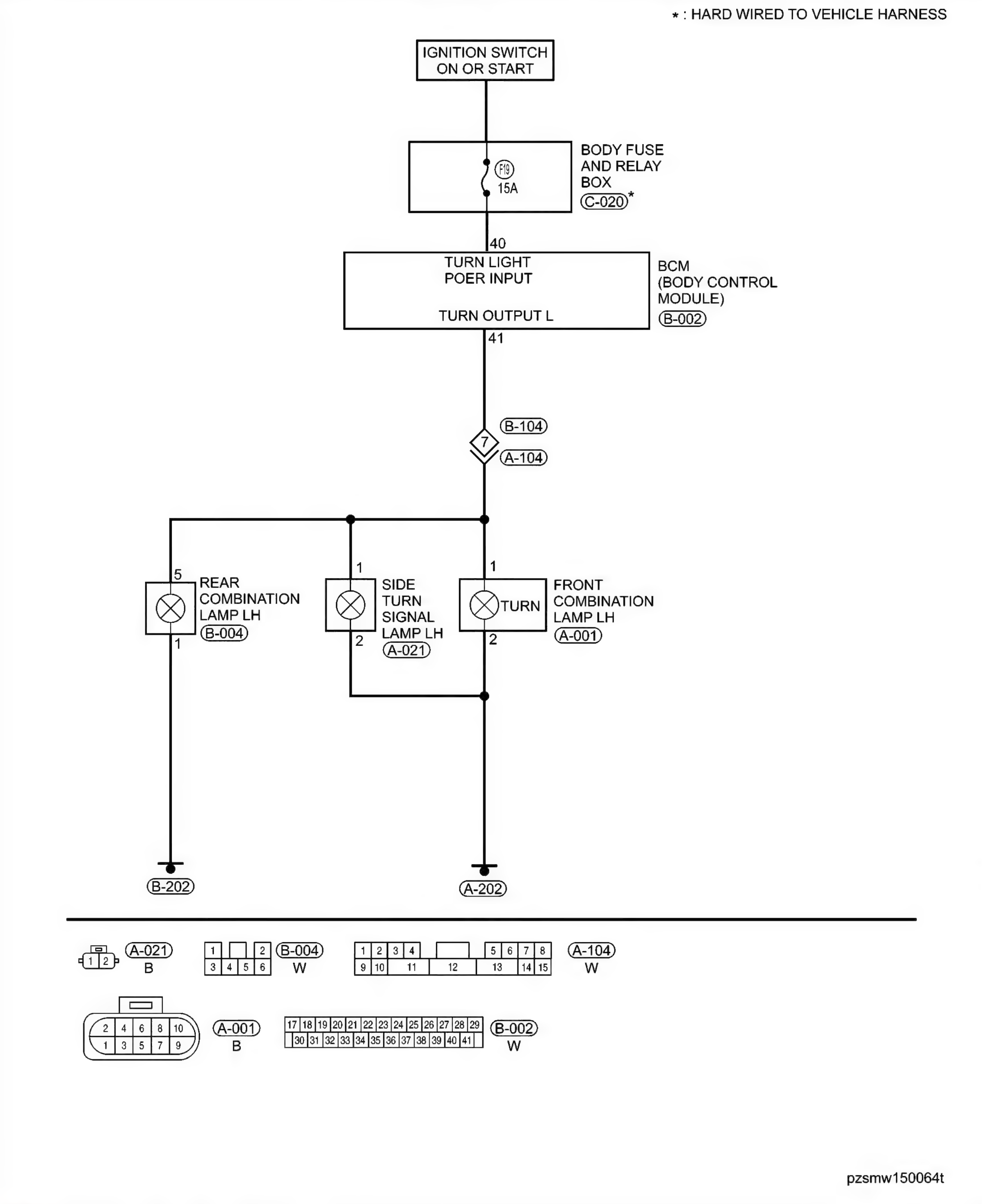
Diagnostic Trouble Code (DTC) List

Body Control Module DTC List

DTC	DTC DEFINITION
B1000	Left Turn Lights Control Circuit Low Current
B1001	Left Turn Lights Control Circuit Short to Ground
B1004	Right Turn Lights Control Circuit Low Current
B1005	Right Turn Lights Control Circuit Shorted to Ground
B1043	Fuse Blown (Turns)
B1100	Dome Light Control Circuit Low Voltage
B1101	Dome Light Control Circuit High Voltage
B1217	RCM Impact Output Circuit No Pulses
B1301	Central Lock Control Circuit Low Current
B1302	Central Lock Control Circuit High Current
B1303	Central Lock Control Circuit Stuck On
B1305	Central Unlock Control Circuit Low Current
B1306	Central Unlock Control Circuit High Current
B1307	Central Unlock Control Circuit Stuck On
B1310	FL Window Up Control Circuit Low Current
B1312	FL Window Up Control Circuit Stuck On
B1314	FL Window Down Control Circuit Low Current
B1316	FL Window Down Control Circuit Stuck On
B1319	FR Window Up Control Circuit Low Current
B1321	FR Window Up Control Circuit Stuck On
B1323	FR Window Down Control Circuit Low Current
B1325	FR Window Down Control Circuit Stuck On
B1328	RL Window Up Control Circuit Low Current
B1330	RL Window Up Control Circuit Stuck On
B1332	RL Window Down Control Circuit Low Current
B1334	RL Window Down Control Circuit Stuck On
B1337	RR Window Up Control Circuit Low Current
B1341	RR Window Down Control Circuit Low Current

Diagnostic Trouble Code (DTC) Tests

B1000 - Left Turn Lights Control Circuit Low Current


* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BODY FUSE AND RELAY BOX
C-020 *
F19
15A
40
TURN LIGHT POER INPUT
TURN OUTPUT L
BCM (BODY CONTROL MODULE)
B-002
41
B-104
7
A-104
5
REAR COMBINATION LAMP LH
B-004
1
1
SIDE TURN SIGNAL LAMP LH
A-021
2
1
TURN
FRONT COMBINATION LAMP LH
A-001
2
B-202
A-202
A-021 B
B-004 W
A-104 W
A-001 B
B-002 W
pzsmw150064t

Check reference values between BCM terminals and ground under the following conditions:

BCM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
41	Left Turn Out	Ignition switch: ON Turn signal switch: LH turn signal light ON	0 V or 12 V intermittent

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B1001	Left turn lights control circuit low current	Ignition switch: OFF Turn the front dome lamp switch to DOOR position Close all the doors Press the lock/ unlock button on the Remote Keyless Entry (RKE) transmitter	The Body Control Module (BCM) detects the LH turn signal lamp control circuit open condition.	• Front or rear LH turn lamp • Harness or connectors • BCM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

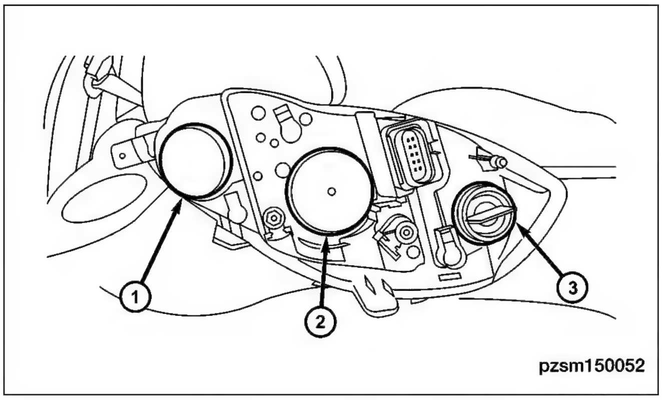
- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the BCM.
- Turn ignition switch off.
- Turn the front dome lamp switch to DOOR position and close all the doors.
- Press the unlock button on the Remote Keyless Entry (RKE) transmitter.
- With X-431 select view active DTCs and data stream in the BCM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

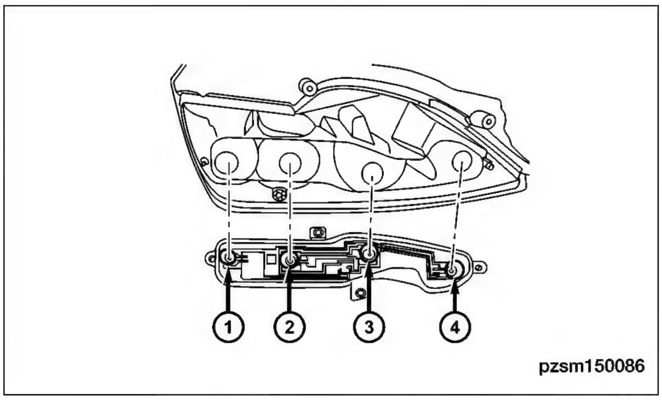
1. CHECK THE LH TURN SIGNAL BULBS

- Turn the LH turn signal switch off.
- Disconnect the front LH turn signal lamp (3).



1	High Beam Lamp Bulb Front Position Lamp Bulb	12 V (65 W) 12 V (5 W)
2	Low Beam Lamp Bulb	12 V (55 W)
3	Front Turn Signal Lamp Bulb	12 V (21 W)

- Disconnect the rear LH turn signal lamp bulb (1).
- Remove and inspect the LH turn signal bulb.



LIGHT BULB POWER RATINGS		
1	Rear Turn Signal Lamp Bulb	12 V (21 W)
2	Stop Lamp Bulb	12 V (21 W)
3	Rear Position Lamp Bulb	12 V (5 - 21 W)
4	Rear Fog Lamp Bulb/Backup Lamp Bulb	12 V (21 W)

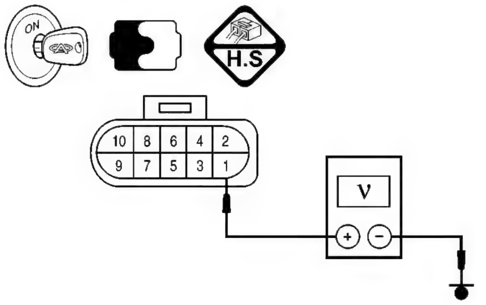
Is the front LH or rear LH turn signal bulb OK?

Yes >> Install the bulbs, go to the next step.

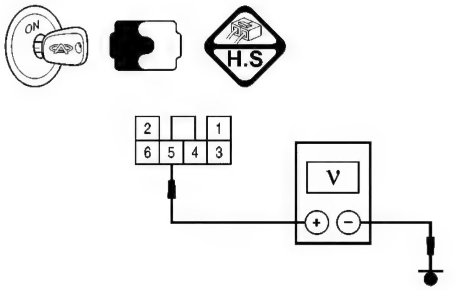
No >> Replace the LH turn signal bulb(s) as necessary.

2. CHECK THE LH TURN SIGNAL LAMP POWER SUPPLY

- Turn ignition switch on.
- Turn the LH turn signal lamp on.
- Check voltage between the front LH turn signal lamp harness connector A-001, terminal 1 and ground.

FRONT TURN SIGNAL LAMP TERMINAL	**GROUND**	 pzsmd150006
1		

- Check voltage between the rear LH turn signal lamp harness connector B-004, terminal 5 and ground.

REAR TURN SIGNAL LAMP TERMINAL	**GROUND**	 pzsmd150007
5		

- 12 V should intermittently exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open in harness or connectors between BCM and LH turn signal lamp.

3. CHECK THE LH TURN SIGNAL LAMPS GROUND CIRCUIT

- Turn ignition switch off.
- Disconnect the front and rear LH turn signal lamp connectors.
- Check resistance between the front LH turn signal lamp harness connector A-001, terminal 2 and ground.
- Check resistance between the rear LH turn signal lamp harness connector B-004, terminal 1 and ground.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the ground circuit for an open or high resistance in harness or connectors.

4. CHECK DTC

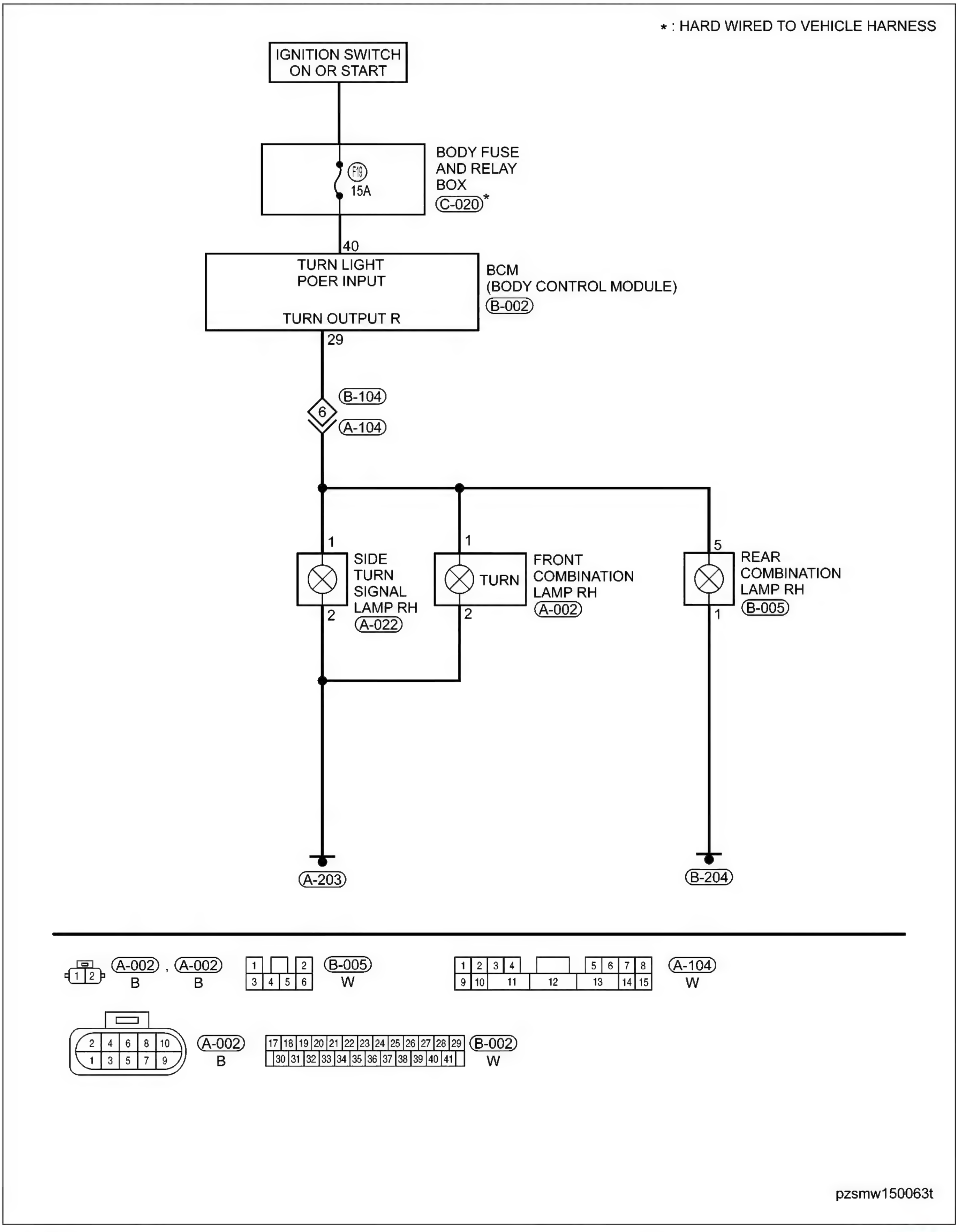
- With the X-431 scan tool, read BCM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC B1000 present?

Yes >> Replace BCM.

No >> The system is now operating properly.
Reassemble the vehicle and verify the customers complaint is repaired.

B1004 - Right Turn Lights Control Circuit Low Current


* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
F19
15A
BODY FUSE AND RELAY BOX
C-020*
40
TURN LIGHT POER INPUT
TURN OUTPUT R
BCM (BODY CONTROL MODULE)
B-002
29
B-104
6
A-104
1
SIDE TURN SIGNAL LAMP RH
A-022
2
1
TURN
FRONT COMBINATION LAMP RH
A-002
2
5
REAR COMBINATION LAMP RH
B-005
1
A-203
B-204
A-002 B
A-002 B
B-005 W
A-104 W
A-002 B
B-002 W
pzsmw150063t

Check reference values between BCM terminals and ground under the following conditions:

BCM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
68	Right Turn Out	Ignition switch: ON Turn signal switch: RH turn signal light ON	0 V or 12 V intermittent

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B1004	Right turn lights control circuit low current	Ignition switch: OFF Turn the front dome lamp switch to DOOR position Close all the doors Press the lock/ unlock button on the Remote Keyless Entry (RKE) transmitter	The Body Control Module (BCM) detects the RH turn signal lights control circuit open condition.	• Front or rear RH turn lamp • Harness or connectors • BCM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the BCM.
- Turn ignition switch off.
- Turn the front dome lamp switch to DOOR position and close all the doors.
- Press the unlock button on the Remote Keyless Entry (RKE) transmitter.
- With X-431 select view active DTCs and data stream in the BCM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

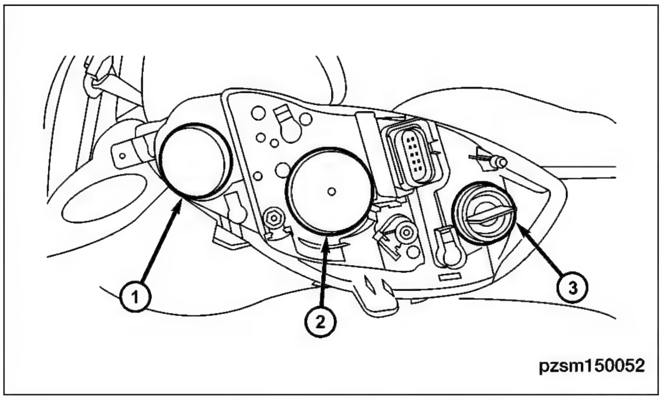
NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

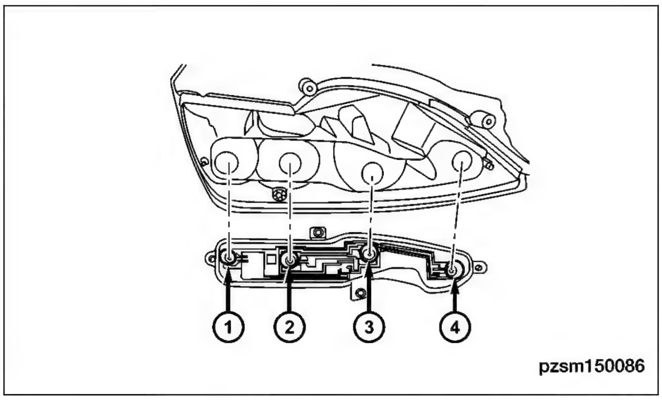
1. CHECK THE RH TURN SIGNAL BULBS

- Turn RH turn signal switch off.
- Disconnect the front RH turn signal lamp (3).



1	High Beam Lamp Bulb Front Position Lamp Bulb	12 V (65 W) 12 V (5 W)
2	Low Beam Lamp Bulb	12 V (55 W)
3	Front Turn Signal Lamp Bulb	12 V (21 W)

- Disconnect the rear RH turn signal lamp bulb (1).
- Remove and inspect the RH turn signal bulbs.



LIGHT BULB POWER RATINGS		
1	Rear Turn Signal Lamp Bulb	12 V (21 W)
2	Stop Lamp Bulb	12 V (21 W)
3	Rear Position Lamp Bulb	12 V (5 - 21 W)
4	Rear Fog Lamp Bulb/Backup Lamp Bulb	12 V (21 W)

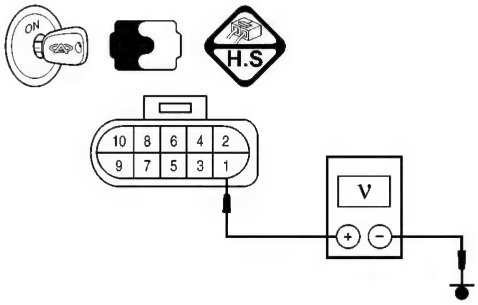
Is the front LH or rear LH turn signal bulb OK?

Yes >> Install the bulbs, go to the next step.

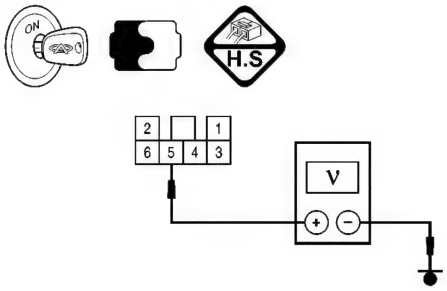
No >> Replace the RH turn signal bulb(s) as necessary.

2. CHECK THE RH TURN SIGNAL LAMPS POWER SUPPLY

- Turn ignition switch on.
- Turn the RH turn signal light on.
- Check voltage between the front RH turn signal lamp harness connector A-002, terminal 1 and ground.

FRONT RH TURN SIGNAL LAMP TERMINAL	**GROUND**	 pzsmd150006
1		

- Check voltage between the rear RH turn signal lamp harness connector B-005, terminal 5 and ground.

REAR TURN SIGNAL LAMP TERMINAL	**GROUND**	 pzsmd150007
5		

- 12 V should intermittently exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open in harness or connectors between BCM and RH turn signal lamp.

3. CHECK THE RH TURN SIGNAL LAMPS GROUND CIRCUIT.

- Turn ignition switch off.
- Disconnect the front and rear RH turn signal lamp connectors.
- Check resistance between the front RH turn signal lamp harness connector A-002, terminal 2 and ground.
- Check resistance between the rear RH turn signal lamp harness connector B-005, terminal 1 and ground.
- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the ground circuit for an open or high resistance in harness or connectors.

4. CHECK DTC

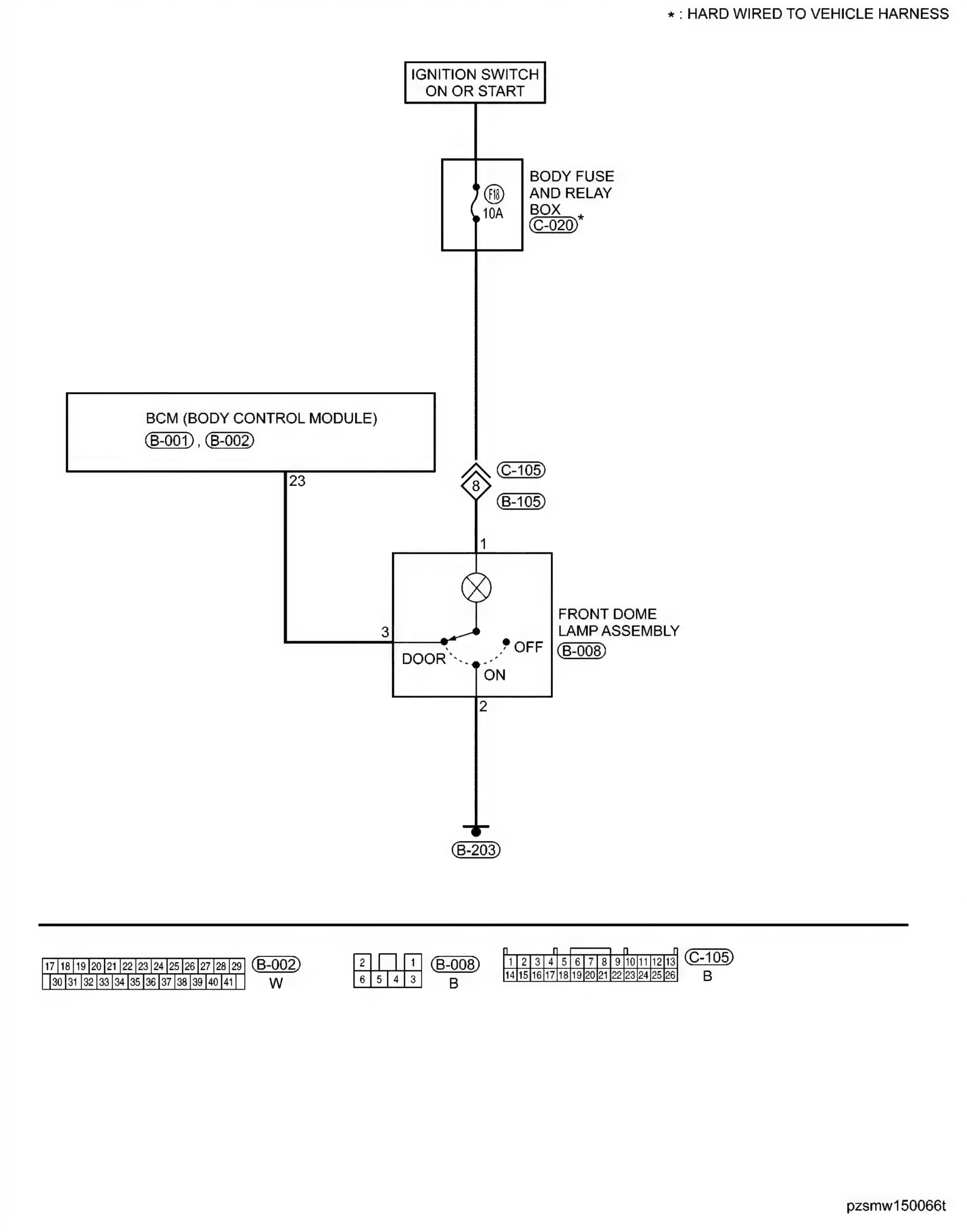
- With the X-431 scan tool, read BCM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC B1004 still present?

Yes >> Replace BCM.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

B1100 - Dome Light Control Circuit Low Voltage


* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
F18
10A
BODY FUSE AND RELAY BOX
C-020*
BCM (BODY CONTROL MODULE)
B-001 , B-002
23
C-105
8
B-105
1
3
FRONT DOME LAMP ASSEMBLY
B-008
DOOR
OFF
ON
2
B-203
17 18 19 20 21 22 23 24 25 26 27 28 29
30 31 32 33 34 35 36 37 38 39 40 41
B-002
W
2 1
6 5 4 3
B-008
B
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
C-105
B
pzsmw150066t

Check reference values between BCM terminals and ground under the following conditions:

BCM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
23	Dome lamp	Ignition switch: ON Dome switch: DOOR position Door ajar position: OPEN	0 V

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B1100	Dome light control circuit low voltage	Ignition switch: OFF Turn the front dome lamp switch to DOOR position Close all the doors Press the unlock button on the Remote Keyless Entry (RKE) transmitter	The Body Control Module (BCM) detects the dome lamp control circuit open condition.	• Dome lamp • Harness or connectors • BCM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the BCM.
- Turn ignition switch off.
- Turn the front dome lamp switch to DOOR position and close all the doors.
- Press the unlock button on the Remote Keyless Entry (RKE) transmitter.
- With X-431 select view active DTCs and data stream in the BCM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK THE FRONT DOME LAMP FUSE

- Turn ignition switch off.
- Remove and check the front dome lamp fuse F18 (10A) in body fuse and relay box C-020.

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the damaged fuse. Go to step 3.

NOTE : Inspect the fuses. If an open fuse is found, use the electrical schematics as a guide and inspect the wiring and connectors for damage.

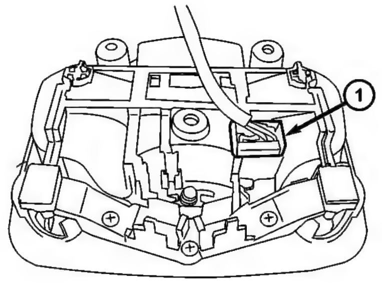
2. CHECK THE FRONT DOME BULB

- Disconnect the front dome lamp connector (1) B-008.
- Remove and inspect the front dome bulb.

Is the front dome bulb OK?

Yes >> Go to the next step.

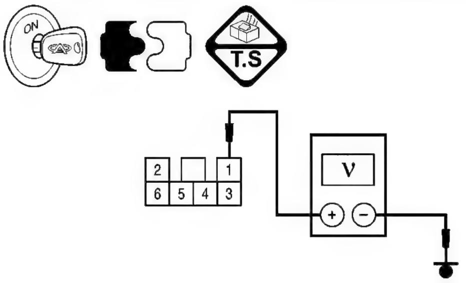
No >> Replace the front dome bulb.



pzsm150194

3. CHECK THE FRONT DOME LAMP POWER SUPPLY

- Turn ignition switch on.
- Check voltage between the front dome lamp harness connector B-008, terminal 1 and ground.

FRONT DOME LAMP TERMINAL	GROUND	 pzsmd150004
1		

- 12 V should exist.

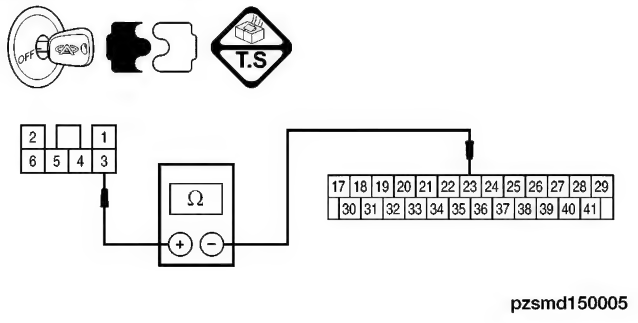
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit for an open or a short in harness or connectors between the front dome lamp harness connector and fuse F18.
Check the body fuse and relay box C-020.

4. CHECK THE FRONT DOME LAMP CONTROL CIRCUIT

- Turn ignition switch off.
- Disconnect the Body Control Module (BCM) connector B-002.
- Check resistance between terminal 3 in the front dome lamp harness connector B-008 and terminal 23 in BCM connector B-002.

FRONT DOME LAMP TERMINAL	BCM TERMINAL	 OFF T.S 2 1 6 5 4 3 Ω + − 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 pzsmd150005
3	23	

- Continuity should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the control circuit for an open or high resistance in harness or connectors.

5. CHECK DTC

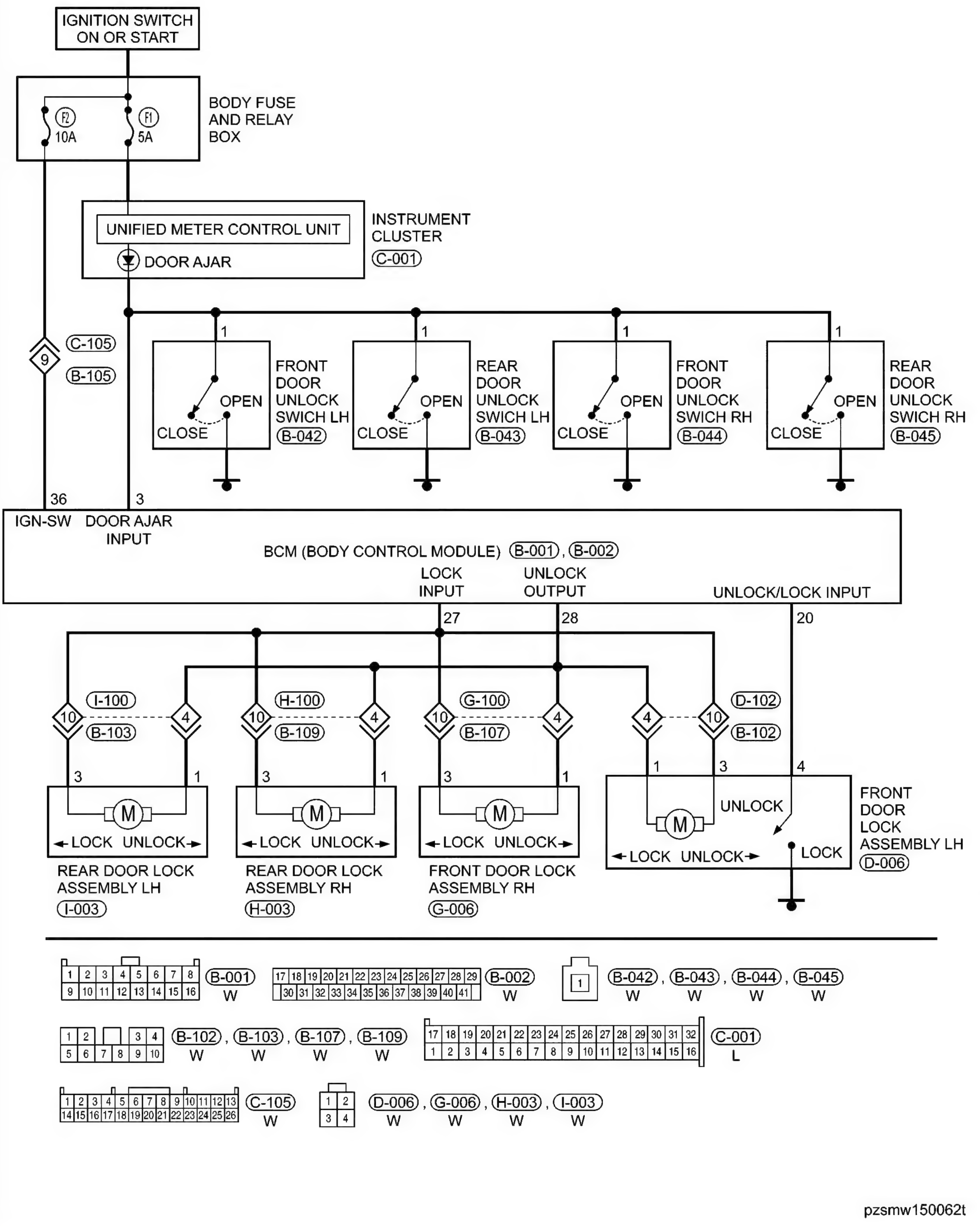
- Reconnect all previously disconnected components.
- With the X-431 scan tool, read BCM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC B1100 still present?

Yes >> Replace the BCM.

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

B1301 - Central Lock Control Circuit Low Current


IGNITION SWITCH ON OR START
BODY FUSE AND RELAY BOX
F2
10A
F1
5A
UNIFIED METER CONTROL UNIT
DOOR AJAR
INSTRUMENT CLUSTER
C-001
C-105
9
B-105
1
FRONT DOOR UNLOCK SWICH LH
B-042
REAR DOOR UNLOCK SWICH LH
B-043
FRONT DOOR UNLOCK SWICH RH
B-044
REAR DOOR UNLOCK SWICH RH
B-045
OPEN
CLOSE
36
3
IGN-SW
DOOR AJAR INPUT
BCM (BODY CONTROL MODULE) B-001, B-002
LOCK INPUT
UNLOCK OUTPUT
UNLOCK/LOCK INPUT
27
28
20
I-100
B-103
H-100
B-109
G-100
B-107
D-102
B-102
10
4
3
1
4
M
LOCK
UNLOCK
REAR DOOR LOCK ASSEMBLY LH
I-003
REAR DOOR LOCK ASSEMBLY RH
H-003
FRONT DOOR LOCK ASSEMBLY RH
G-006
FRONT DOOR LOCK ASSEMBLY LH
D-006
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B-001
W
17 18 19 20 21 22 23 24 25 26 27 28 29
30 31 32 33 34 35 36 37 38 39 40 41
B-002
W
1
B-042, B-043, B-044, B-045
W W W W
1 2 3 4
5 6 7 8 9 10
B-102, B-103, B-107, B-109
W W W W
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-001
L
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
C-105
W
1 2
3 4
D-006, G-006, H-003, I-003
W W W W
pzsmw150062t

Check reference values between BCM terminals and ground under the following conditions:

BCM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
27	Lock out	With the door lock or unlock switch activated	12 V
28	Unlock out		

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B1301	Central lock control circuit low current	With the door lock switch activated	When the Body Control Module (BCM) detects the lock control circuit low condition.	• Door lock actuator • Harness or connectors • BCM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

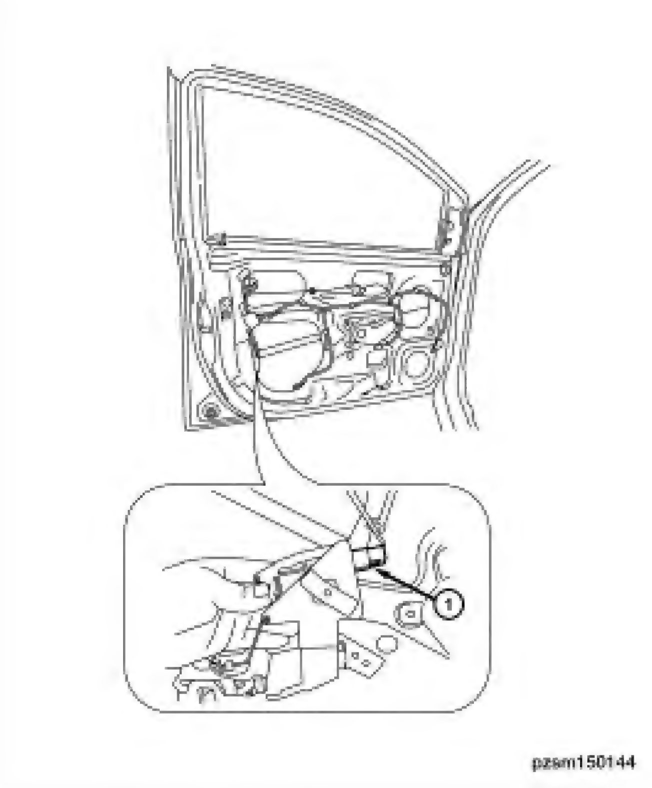
- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the BCM.
- Operate the lock and unlock switch several times.
- With X-431 select view active DTCs and data stream in the BCM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

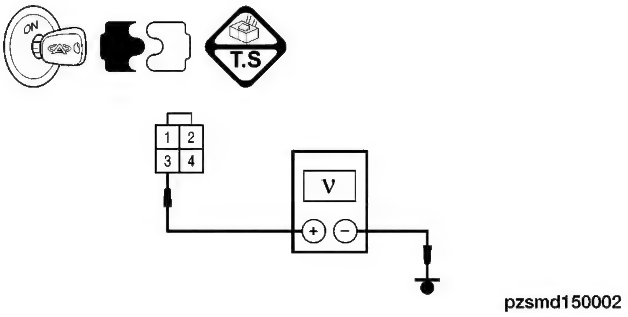
Diagnostic Procedure

1. CHECK CENTRAL LOCK ACTUATOR POWER SUPPLY

- Turn ignition switch off.
- Disconnect central lock actuator electrical connector (1) D-006.
- Turn ignition switch on.



- Check voltage between the central lock actuator harness connector D-006 , G-006 , H-003 or I-003 terminal 3 and ground while operating the center lock switch in the lock position.

CENTRAL LOCK ACTUATOR TERMINAL	GROUND	
3		

- 12 V should exist.

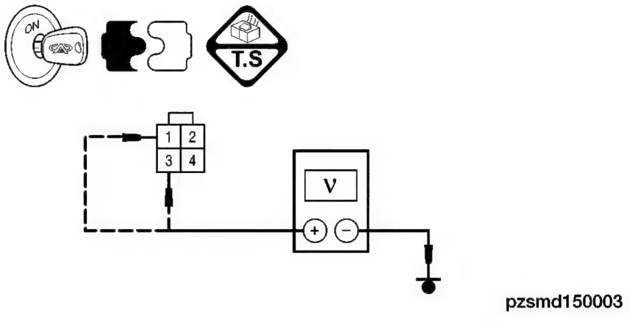
Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the lock control circuit between BCM connector B-002, terminal 28 and door lock actuator connectors for an open or high resistance.

2. CHECK CENTRAL LOCK ACTUATOR RETURN CIRCUIT

- Check voltage between the central lock actuator harness connector D-006 , G-006 , I-003 or H-003, terminal 1 and terminal 3 while operating the center lock switch in lock or unlock position.

CENTRAL LOCK ACTUATOR CONNECTOR TERMINAL	CENTRAL LOCK ACTUATOR CONNECTOR TERMINAL	
1	3	

- 12 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or Replace the lock return circuit between BCM connector B-002, terminal 28 and door lock actuator connectors for an open or high resistance.

3. CHECK CENTRAL LOCK ACTUATORS

- Remove and check the LF, RF, LR and RR central lock actuators.

Are all the central lock actuators OK?

Yes >> Go to the next step.

No >> Replace the central lock actuator(s) as necessary.

4. CHECK DTC

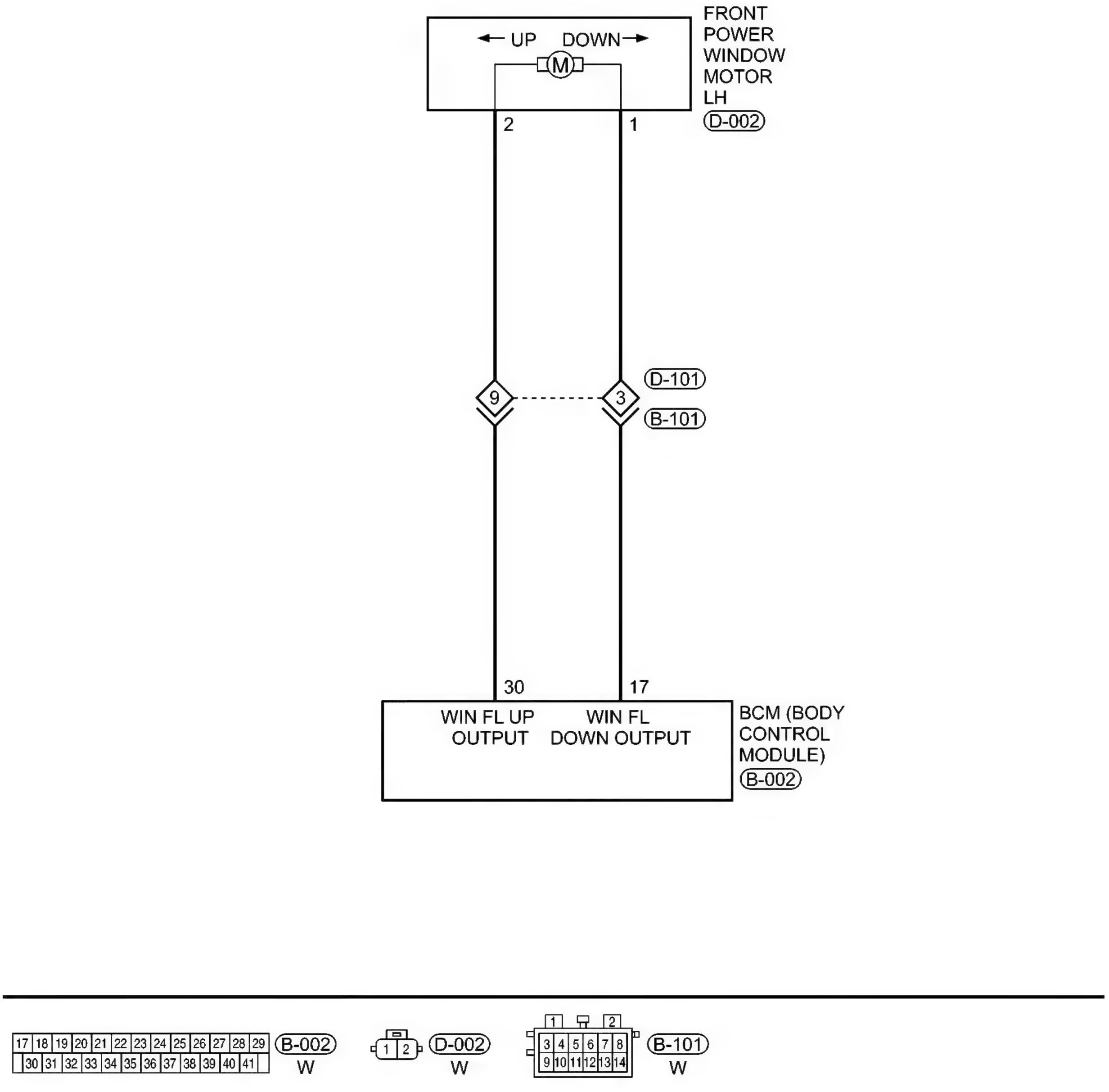
- With the X-431 scan tool, read the BCM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC B1301 still present?

Yes >> Replace the BCM.

No >> The system is now operating properly.
Reassemble the vehicle and verify the customers complaint is repaired.

B1310 - FL Window Up Control Circuit Low Current


UP
DOWN
M
FRONT POWER WINDOW MOTOR LH
D-002
2
1
9
3
D-101
B-101
30
17
WIN FL UP OUTPUT
WIN FL DOWN OUTPUT
BCM (BODY CONTROL MODULE)
B-002
17 18 19 20 21 22 23 24 25 26 27 28 29
30 31 32 33 34 35 36 37 38 39 40 41
B-002
W
1 2
D-002
W
1 2
3 4 5 6 7 8
9 10 11 12 13 14
B-101
W

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Check reference values between BCM terminals and ground under the following conditions:

BCM TERMINAL NO.	ITEM	CONDITION	DATA (AVERAGE DC VOLTAGE)
30	WIN FL Up Out	With the FL window up switch activated.	12 V
17	WIN FL Down Out		

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B1310	FL window up control circuit low current	With the FL window up switch activated.	When the Body Control Module (BCM) detects the FL window up control circuit low condition.	• FL power window motor • Harness or connectors • BCM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the BCM.
- Operate the left front power window switch up and down several times.
- With X-431 select view active DTCs and data stream in the BCM.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

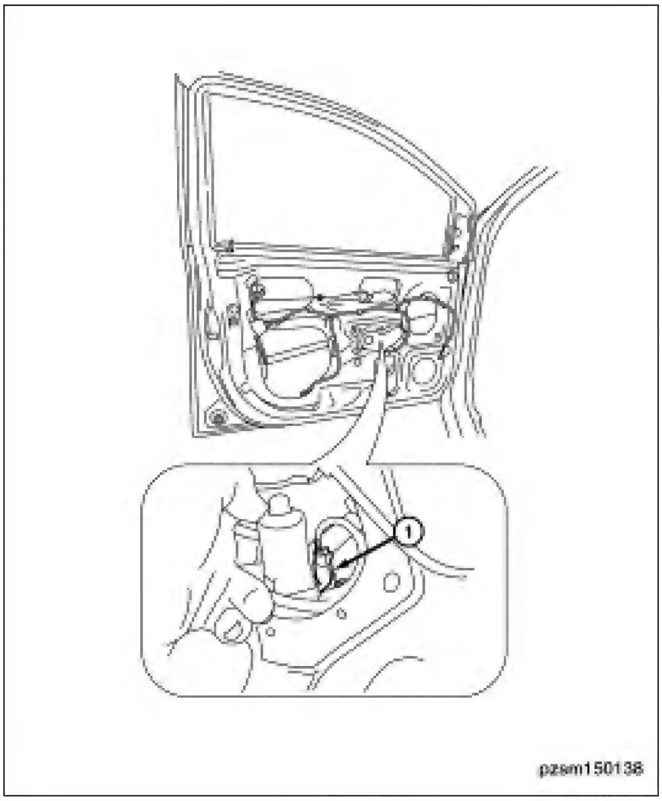
NOTE :

While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

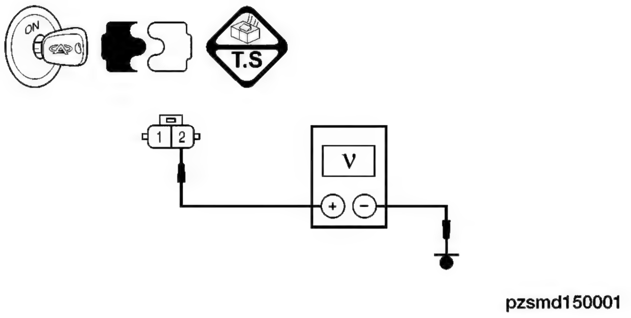
Diagnostic Procedure

1. CHECK FRONT LH POWER WINDOW MOTOR POWER SUPPLY

- Turn ignition switch off.
- Disconnect front LH power window motor harness connector (1) D-002.
- Turn ignition switch on.



- Check voltage between the front LH power window motor harness connector D-002, terminal 2 and ground while operating the left front power window switch in the up position.

FRONT LH POWER WINDOW MOTOR TERMINAL	GROUND	
2		

- 12 V should exist.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the circuit between the BCM connector B-002, terminal 30 and front LH power window motor connectors D-002, terminal 2 for an open or high resistance.

2. CHECK FRONT LH POWER WINDOW MOTOR

- Remove and check the LH front power window motor.

Is the window motor normal?

Yes >> Go to the next step.

No >> Replace the LH front power window motor.

3. CHECK DTC

- With the X-431 scan tool, read the BCM DTCs.
- Refer to ″DTC Confirmation Procedure″.

Is DTC B1310 present?

Yes >> Replace the BCM.

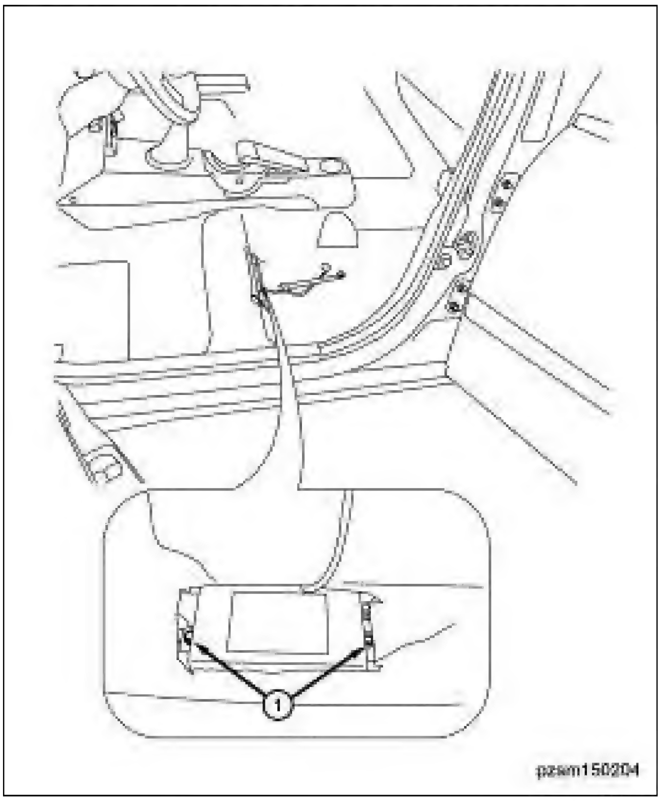
No >> The system is now operating properly.
Reassemble the vehicle and verify the customers complaint is repaired.

ON-VEHICLE SERVICE

Body Control Module (BCM)

Removal & Installation

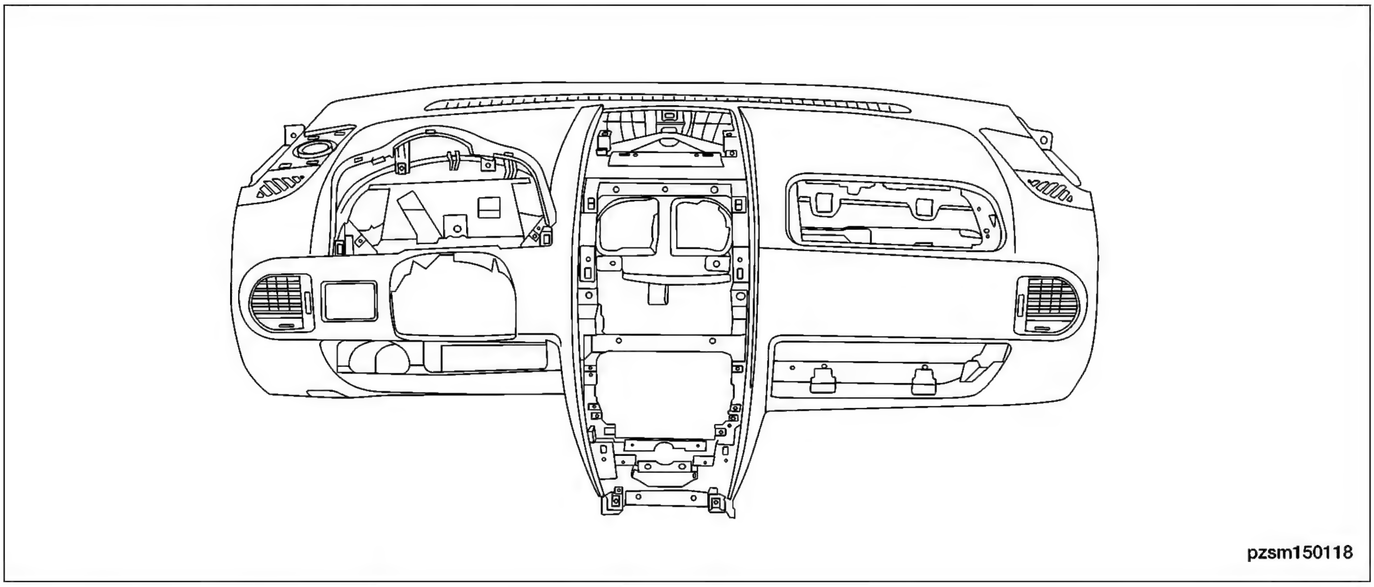
1. Disconnect the negative battery cable.
2. Remove the left front seat (See Front Seat Removal & Installation in Section 15 Body & Accessories).
3. Remove the two BCM retaining bolts (1).
4. Disconnect the BCM electrical connector.
5. Remove the BCM.
6. Installation is in the reverse order of removal.



INSTRUMENT PANEL

Instrument Panel

Removal & Installation



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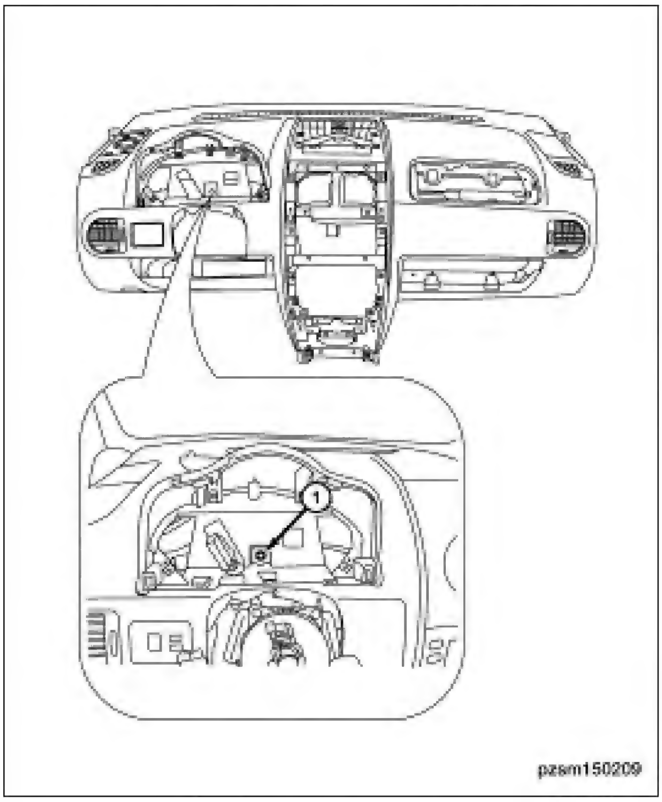
1. Disconnect the negative battery cable.
2. Remove the instrument cluster (See Instrument Cluster Removal & Installation in Section 15 Body & Accessories).
3. Remove the retaining bolt (1).



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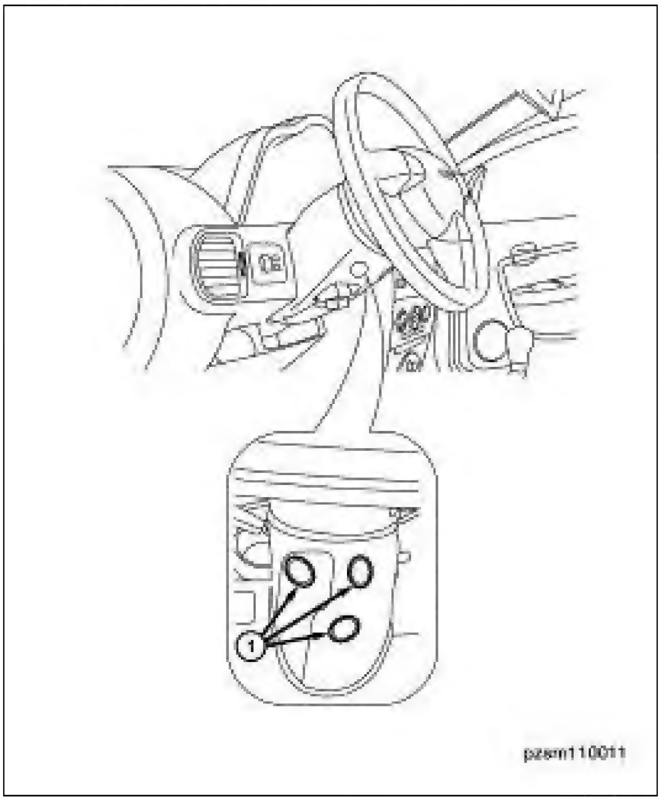
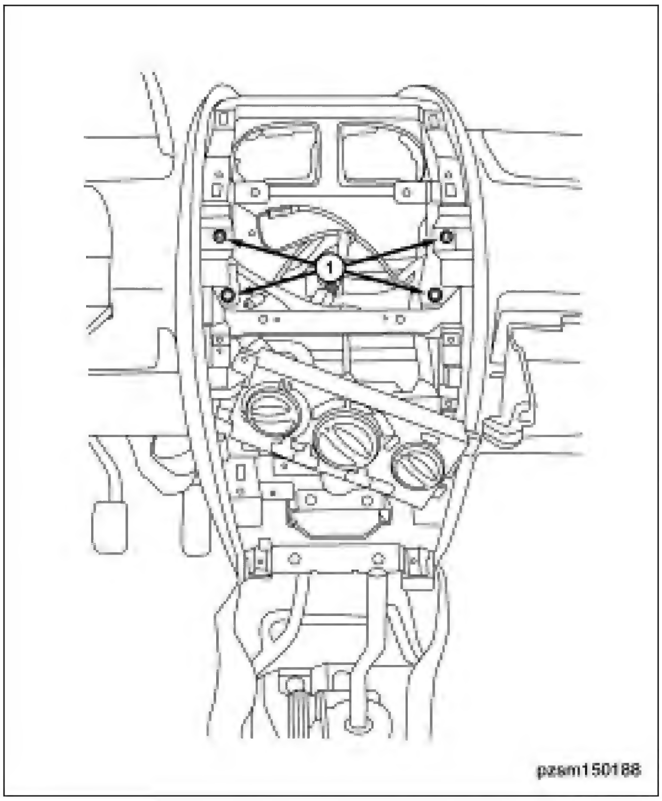
4. Remove the driver airbag (See Driver Airbag Removal & Installation in Section 14 Restraints).

5. Remove the steering wheel (See Steering Wheel Removal & Installation in Section 11 Steering).
6. Remove the shroud retaining screws (1).
7. Remove the shroud.

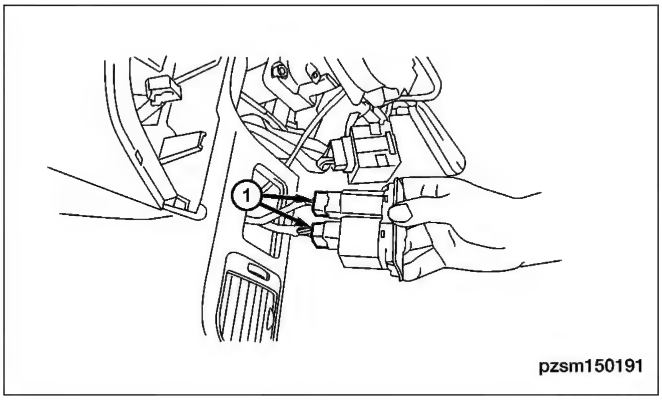


8. Disconnect the spiral cable connector and remove the spiral cable.
9. Remove the lower console (See Lower Console Removal & Installation in Section 15 Body & Accessories).
10. Remove the CD player (See CD Player Removal & Installation in Section 15 Body & Accessories).
11. Remove the HVAC control panel (See HVAC Control Panel Removal & Installation in Section 13 HVAC).
12. Remove the power outlet (See Power Outlet Removal & Installation in Section 15 Body & Accessories).

13. Remove the retaining bolts and screws (1) as shown.

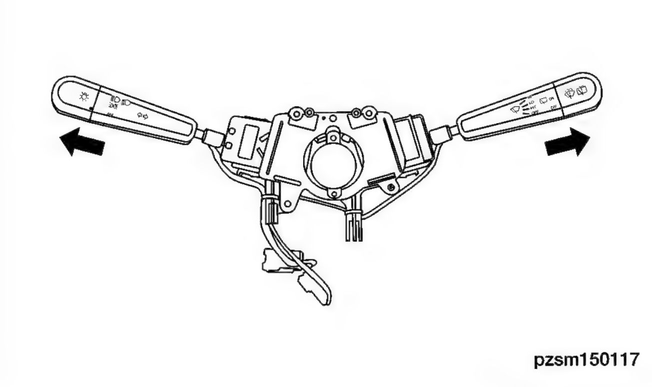


14. Remove the dimmer control switch electrical connectors (1) and remove the dimmer control switch.



15. Remove the following harnesses from the main harness:
    - Body harness
    - Front end module harness
    - Engine control harness
    - A/C harness

16. Remove the wiper switch and high beam switch.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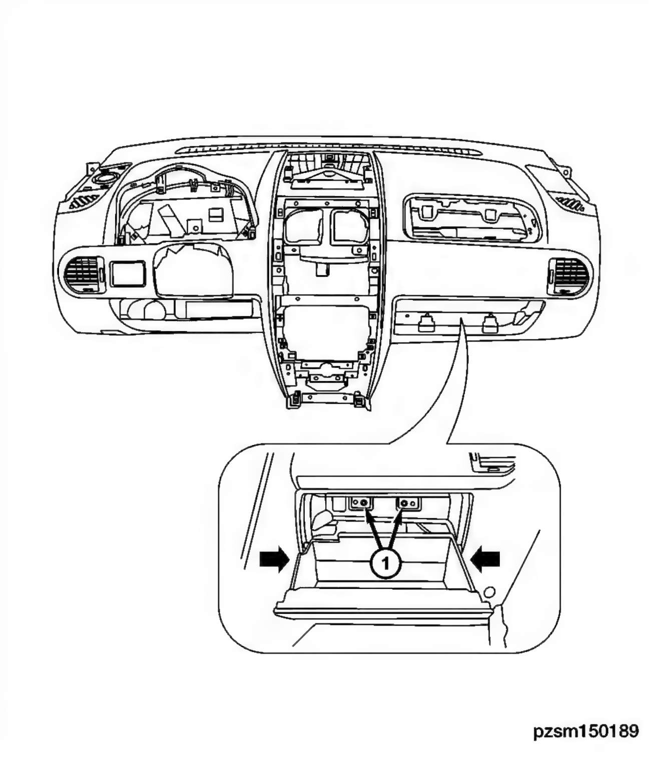
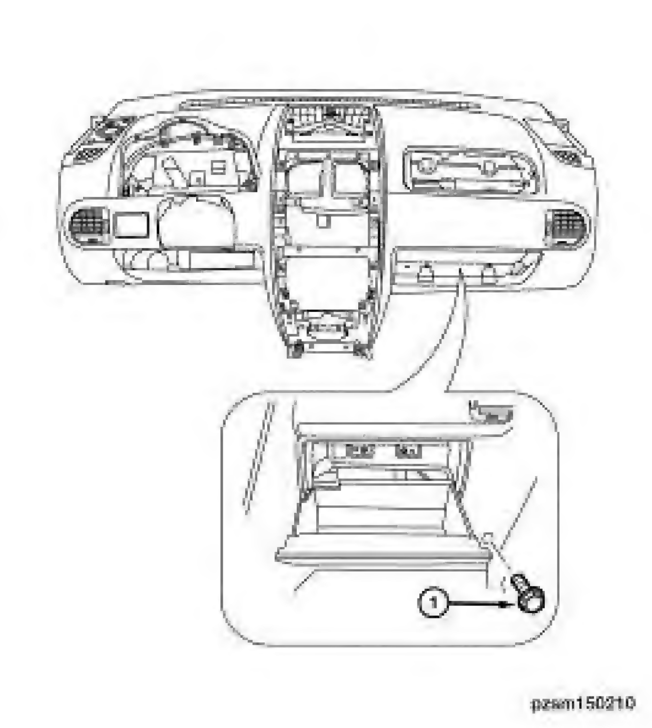
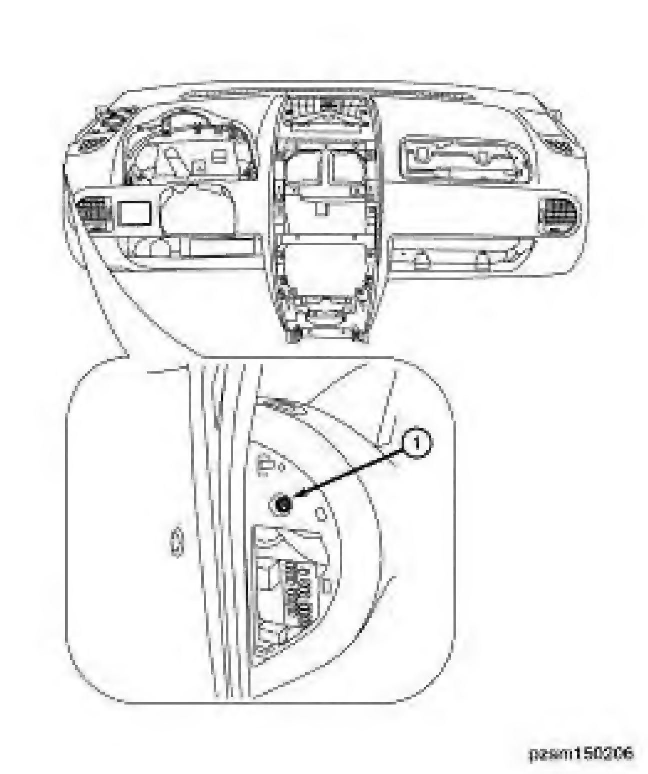
17. Remove the glove box assembly and the passenger side airbag retaining bolts (1).


1
pzsm150189

18. Remove the retaining bolt (1).

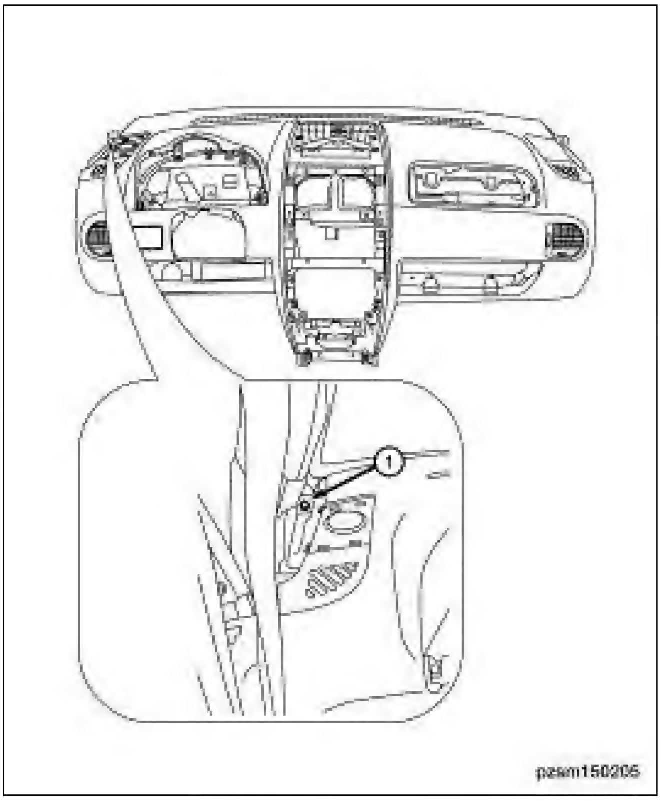


19. Disconnect the passenger airbag electrical connector.
20. Remove the left instrument panel cover assembly and remove the retaining screw (1).
21. Remove the right instrument panel cover assembly and remove the retaining screw.

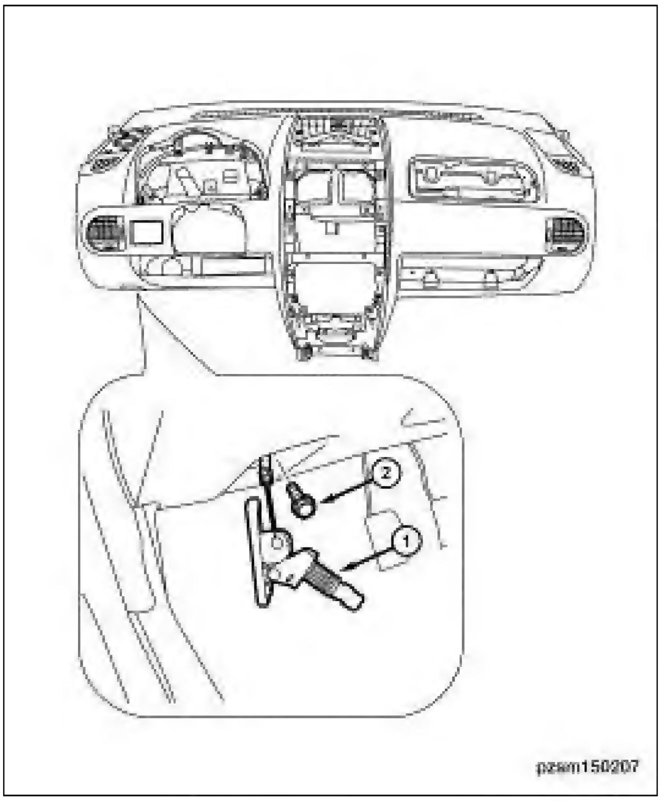


22. Remove the A-pillar panel (See A-Pillar Panel Removal & Installation in Section 15 Body & Accessories).

23. Remove the left instrument panel side retaining bolt (1).
24. Remove the right instrument panel side retaining bolt.

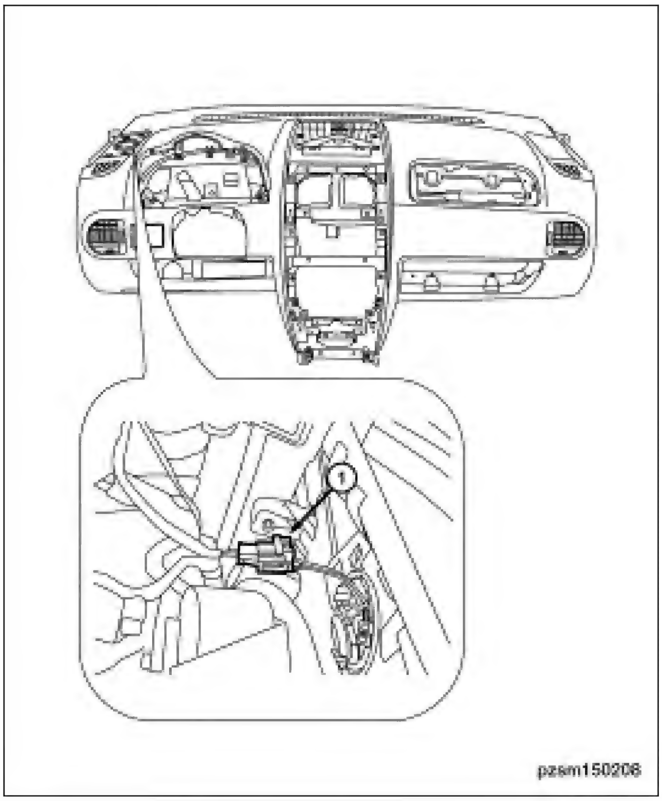


25. Remove the hood release lever (1).
26. Remove the retaining bolt (2).



27. Remove the instrument panel assembly.

28. Disconnect the front tweeter electrical connectors (1).

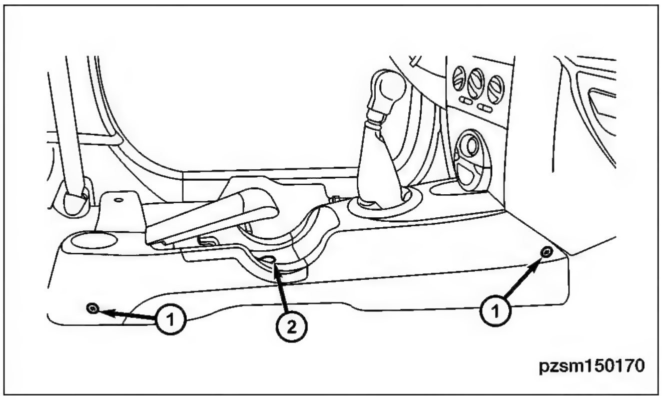

1
pzsm150208

29. Installation is in the reverse order of removal.

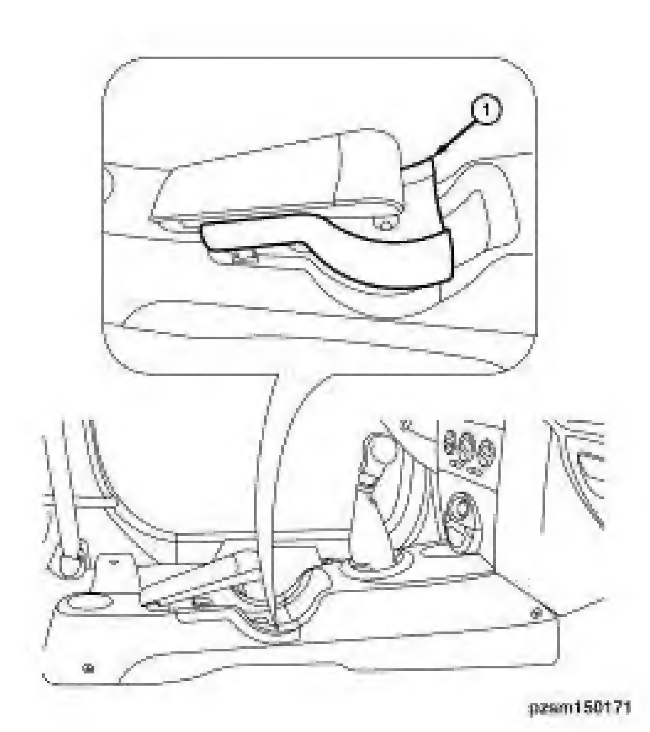
Lower Console

Removal & Installation

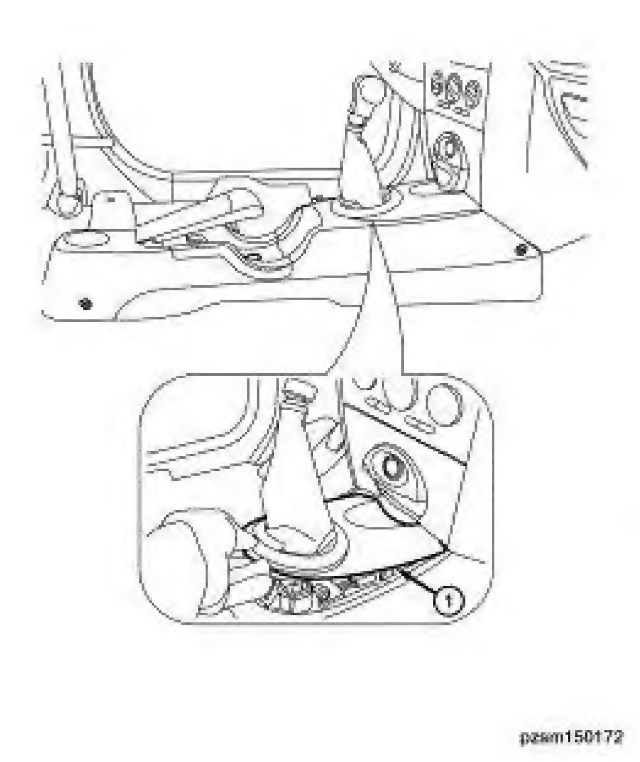
1. Remove the lower console panel retaining screws (1).


1
2
1
pzsm150170

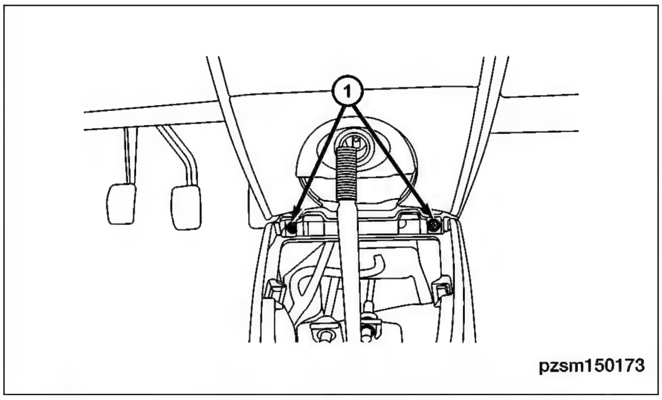
2. Remove the shield (1) from the hand brake.


1
pzsm150171

3. Remove the shield (1) from the gearshift selector.


1
pzsm150172

4. Remove the two retaining screws (1) below the shield.

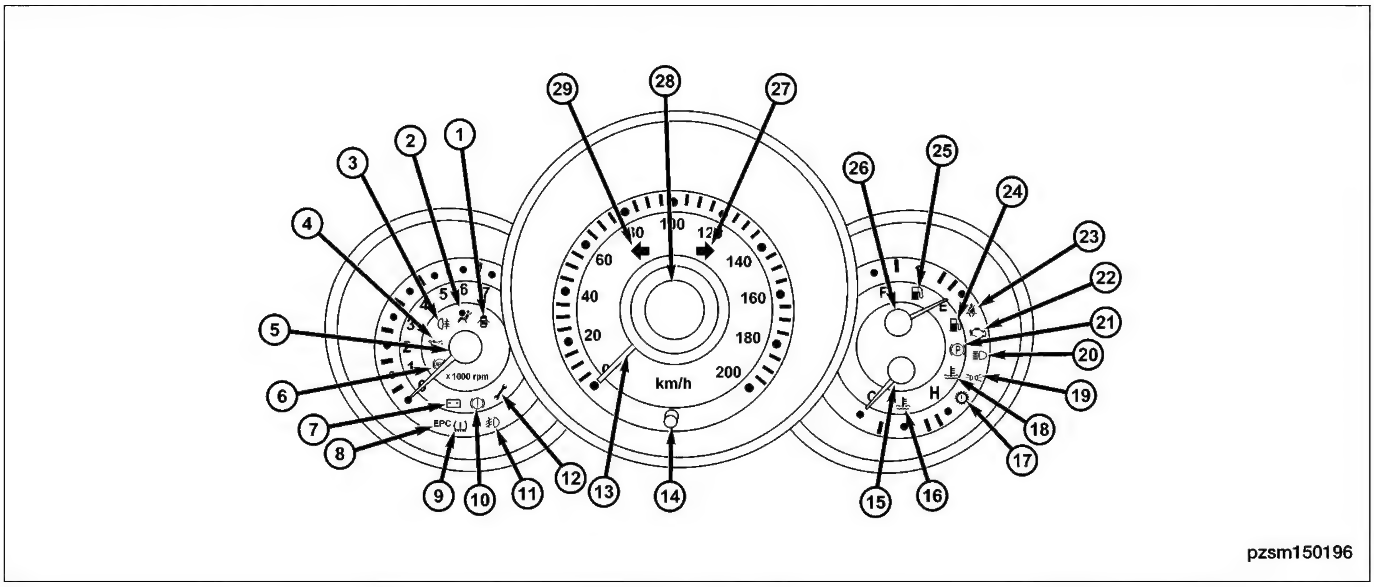


5. Pull the gear selector shield upward by hand (the shield and the lower console are attached with clips and no retaining screws are used).
6. Remove the lower console.
7. Installation is in the reverse order of removal.

INSTRUMENT CLUSTER

Description

The Instrument Cluster (IC) is located in the instrument panel directly in front of the driver. The IC is used to inform the driver of specific vehicle information. The IC uses indicator lamps and gauges to warn the driver of potentially critical operating conditions.



1 - Door Open Warning Display	16 - Temperature Gauge Mark
2 - Airbag Light	17 - TCU Indicator Light
3 - Front Fog Light	18 - Temperature Warning Light
4 - Oil Pressure Light	19 - Parking Light
5 - Tachometer	20 - High Beam Indicator Light
6 - Anti-Lock Brake System (ABS) Warning Light	21 - Parking Brake System Warning Light
7 - Charging System Light Malfunction Indicator Light	22 - Malfunction Indicator Light
8 - Electronic Throttle Control Indicator Light	23 - Seat Belt Reminder Light
9 - Low Tire Warning Light	24 - Low Fuel Warning Light
10 - Brake System Warning Light	25 - Fuel Gauge
11 - Rear Fog Light	26 - Fuel Gauge Mark
12 - Maintenance Indicator Light	27 - Right Turn Light
13 - Speedometer	28 - LCD Display
14 - Trip Odometer/Digital Clock Button	29 - Left Turn Light
15 - Temperature Gauge	

Operation

The Instrument Cluster (IC) uses hard wired inputs from various sensors and switches. The sensors and switches are located throughout the vehicle. The IC displays the following gauges:

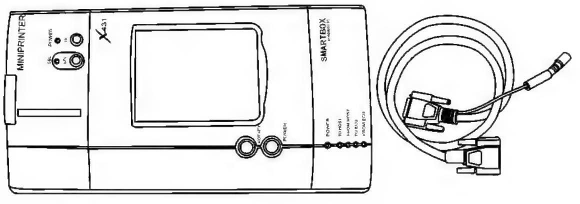
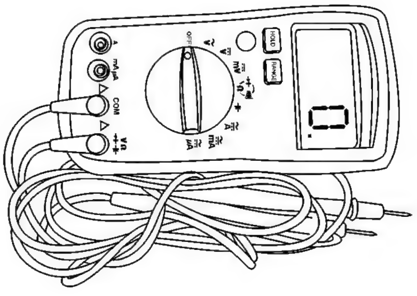
- Speedometer - The IC displays the vehicle speed as determined by the Engine Control Module (ECM) indicating the vehicle speed.
- Tachometer - The IC displays the engine speed as determined by the Engine Control Module (ECM) indicating engine speed.
- Temperature Gauge - The IC displays the engine coolant temperature as determined by the Engine Control Module (ECM) indicating engine coolant temperature.
- Fuel Gauge - The IC displays the amount of fuel in the fuel tank as determined by the fuel level sensor.

Specifications

Torque Specifications

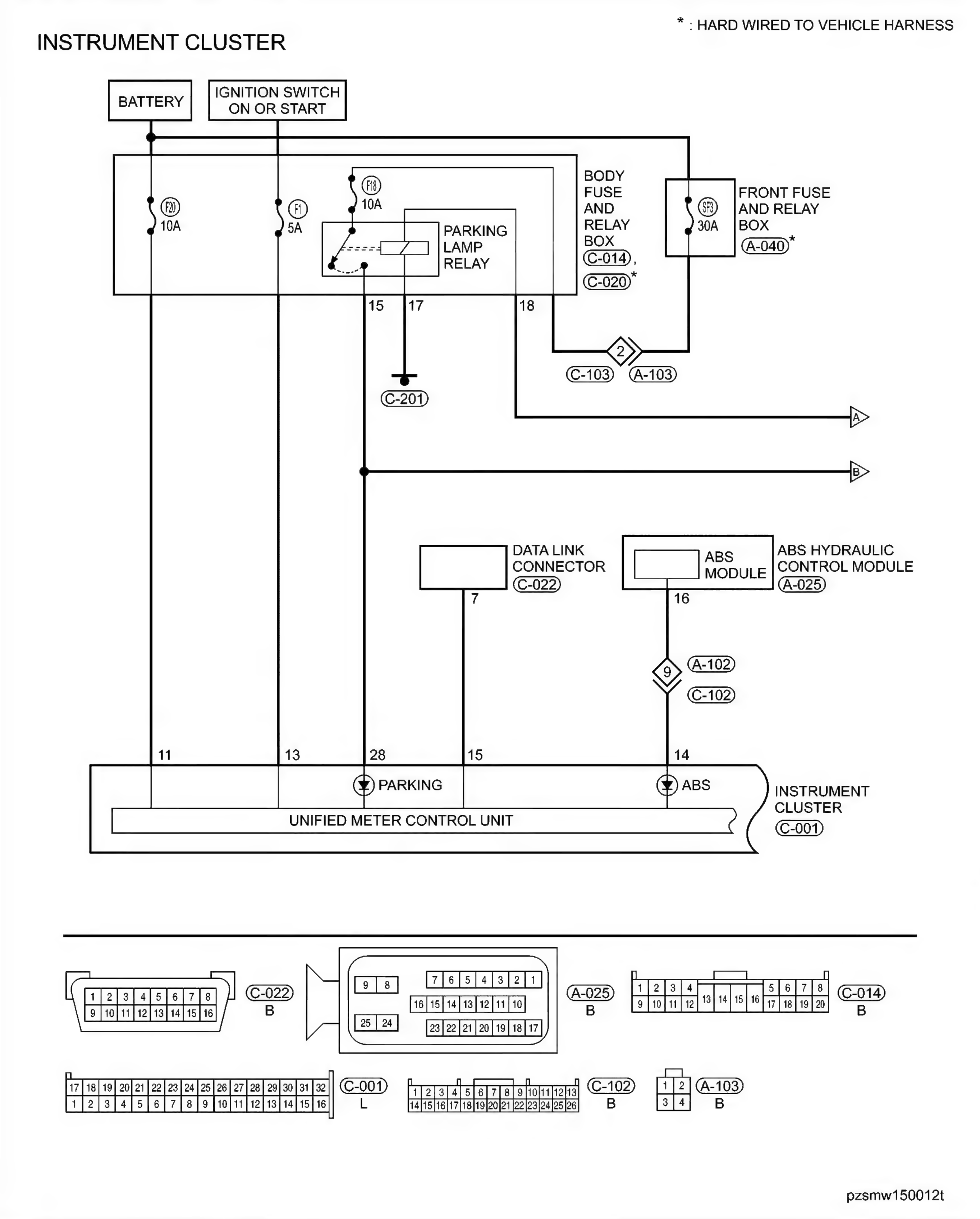
DESCRIPTION	TORQUE (N·m)
Instrument Cluster Bezel Fasteners	2
Instrument Cluster Fasteners	9

Special Tools

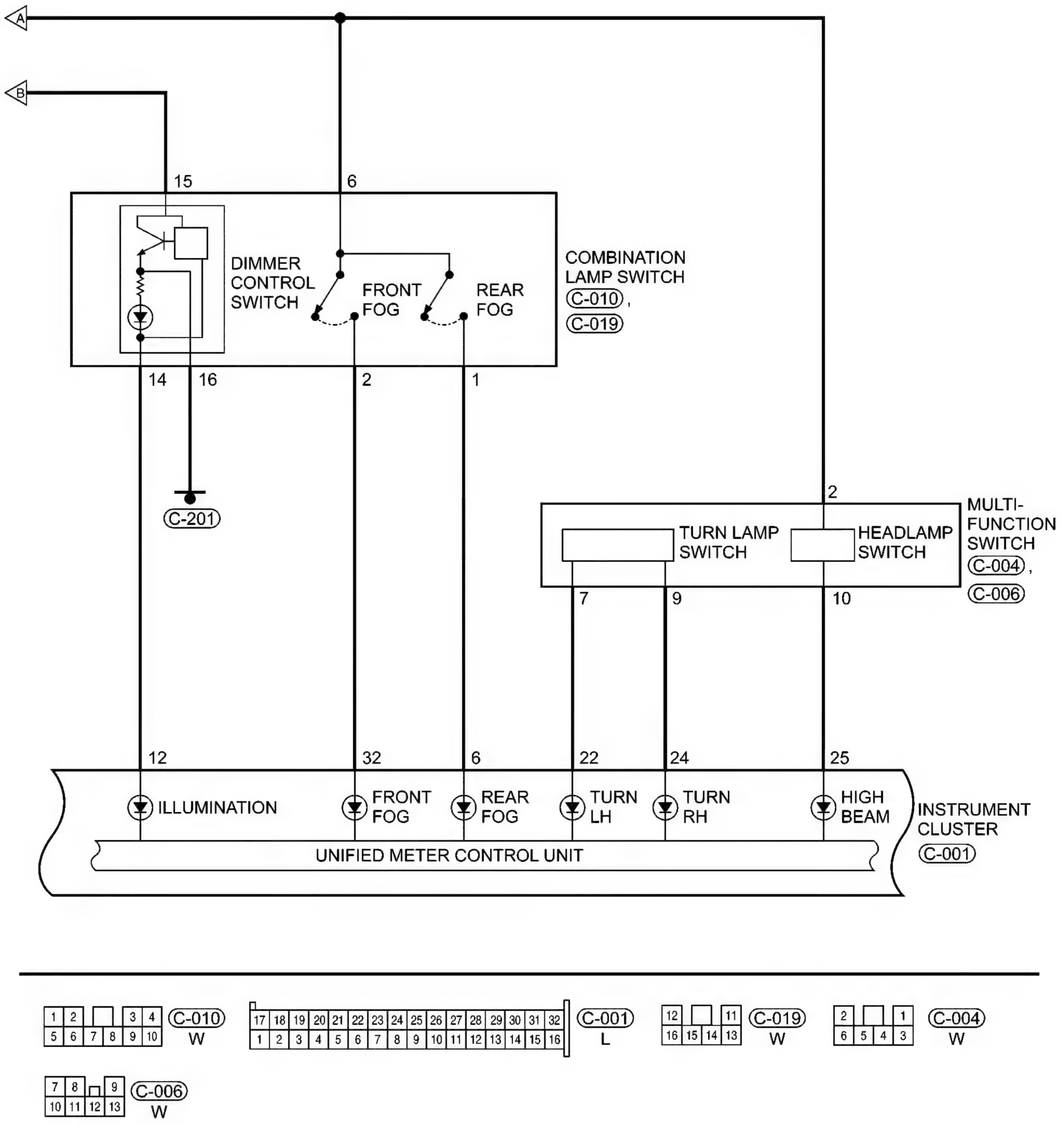
Diagnostic Scan Tool X-431	 MINIPRINTER X431 SMARTBOX besm030001
Digital Multimeter Fluke 15B & 17B	 COM besm030002

Electrical Schematics

Instrument Cluster (Page 1 of 6)

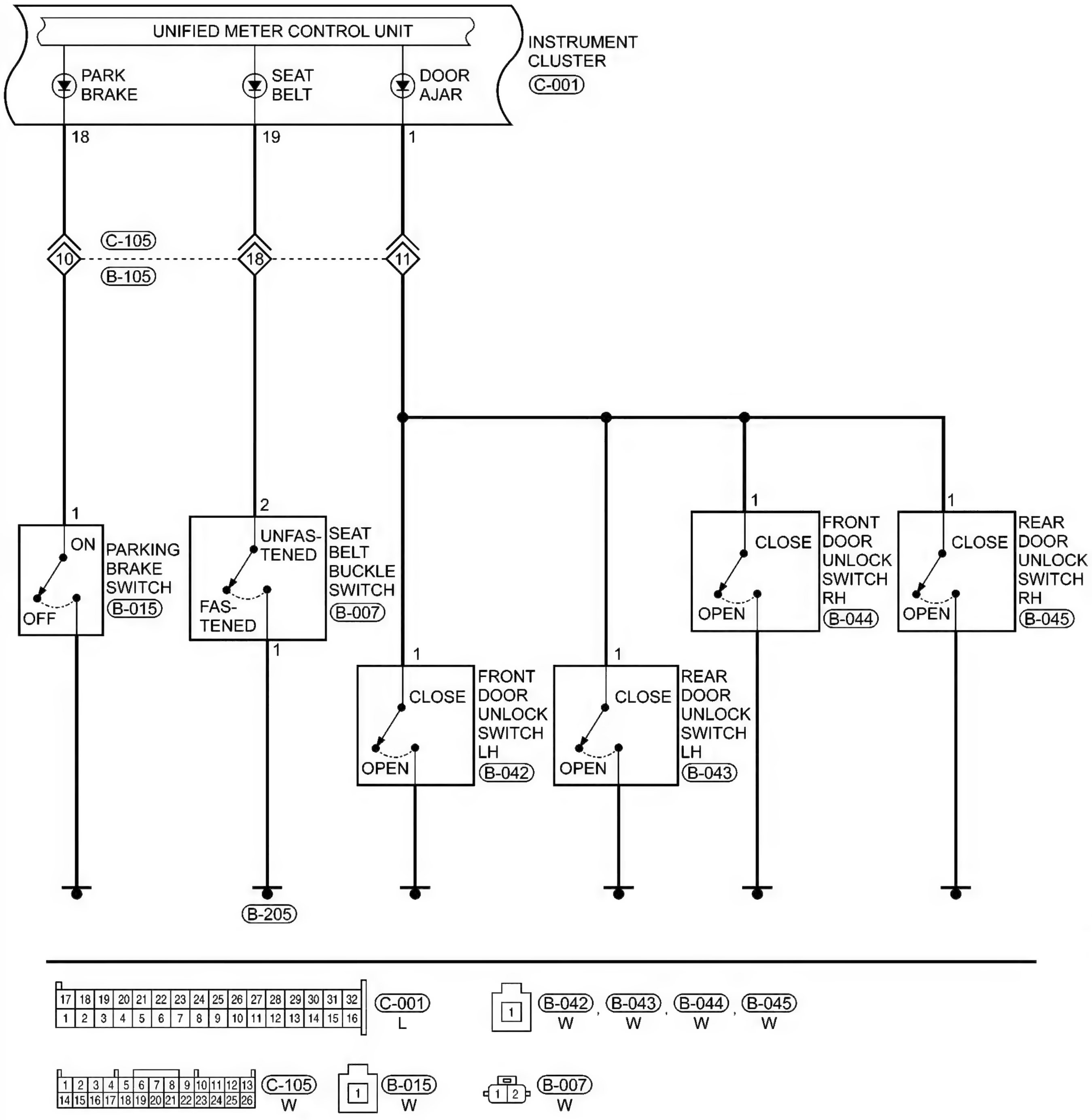

* : HARD WIRED TO VEHICLE HARNESS
INSTRUMENT CLUSTER
BATTERY
IGNITION SWITCH ON OR START
F20 10A
F1 5A
F18 10A
PARKING LAMP RELAY
BODY FUSE AND RELAY BOX
C-014, C-020*
SF3 30A
FRONT FUSE AND RELAY BOX
A-040*
15
17
18
2
C-103
A-103
C-201
A
B
DATA LINK CONNECTOR
C-022
7
ABS MODULE
ABS HYDRAULIC CONTROL MODULE
A-025
16
9
A-102
C-102
11
13
28
15
14
PARKING
ABS
UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
C-022 B
A-025 B
C-014 B
C-001 L
C-102 B
A-103 B
pzsmw150012t

Instrument Cluster (Page 2 of 6)


A
B
15
6
DIMMER CONTROL SWITCH
FRONT FOG
REAR FOG
COMBINATION LAMP SWITCH
C-010,
C-019
14
16
2
1
C-201
2
TURN LAMP SWITCH
HEADLAMP SWITCH
MULTI-FUNCTION SWITCH
C-004,
C-006
7
9
10
12
32
6
22
24
25
ILLUMINATION
FRONT FOG
REAR FOG
TURN LH
TURN RH
HIGH BEAM
INSTRUMENT CLUSTER
C-001
UNIFIED METER CONTROL UNIT
1 2 3 4 5 6 7 8 9 10
C-010
W
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-001
L
12 11 16 15 14 13
C-019
W
2 1 6 5 4 3
C-004
W
7 8 9 10 11 12 13
C-006
W

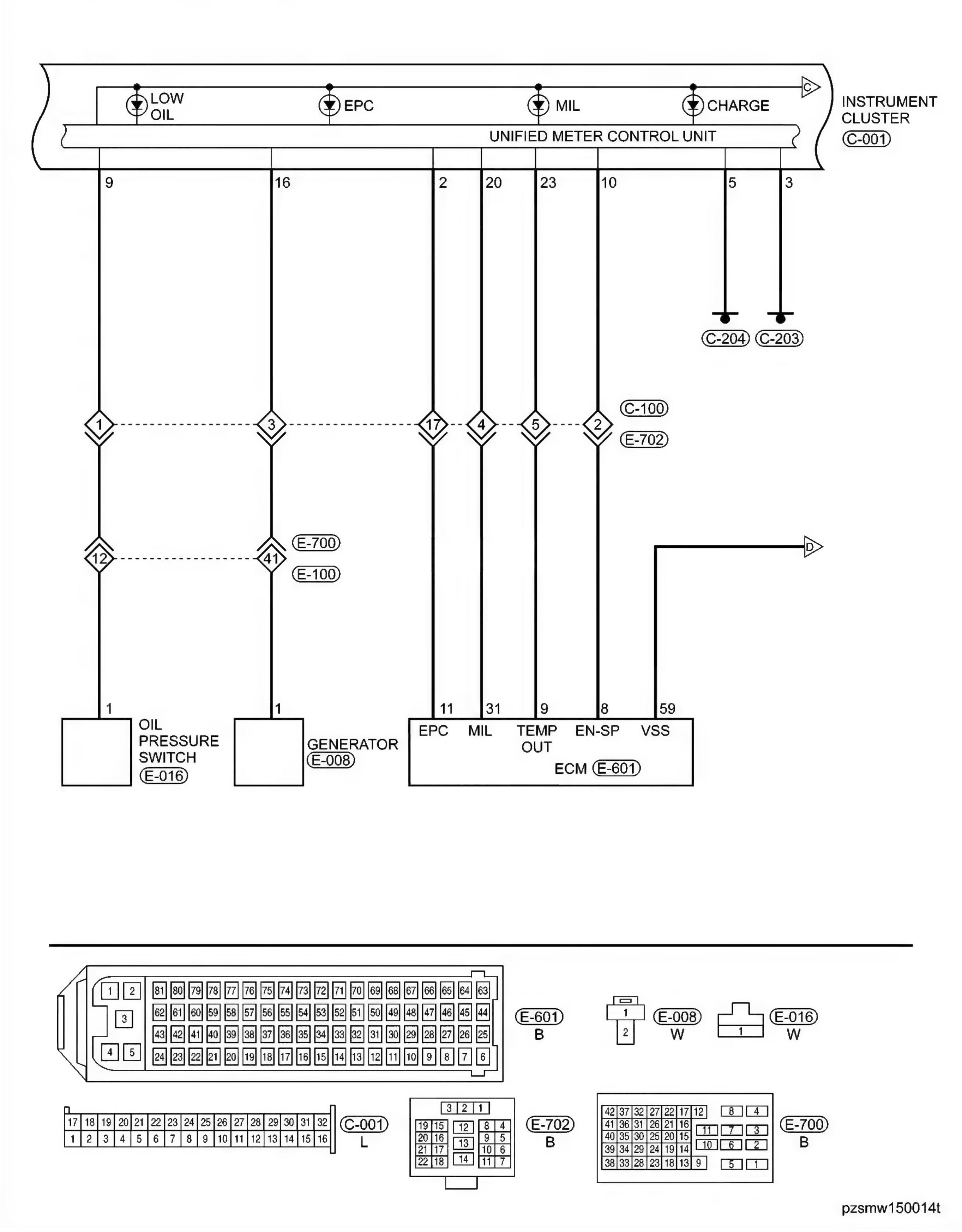
pzsmw150018t

Instrument Cluster (Page 3 of 6)

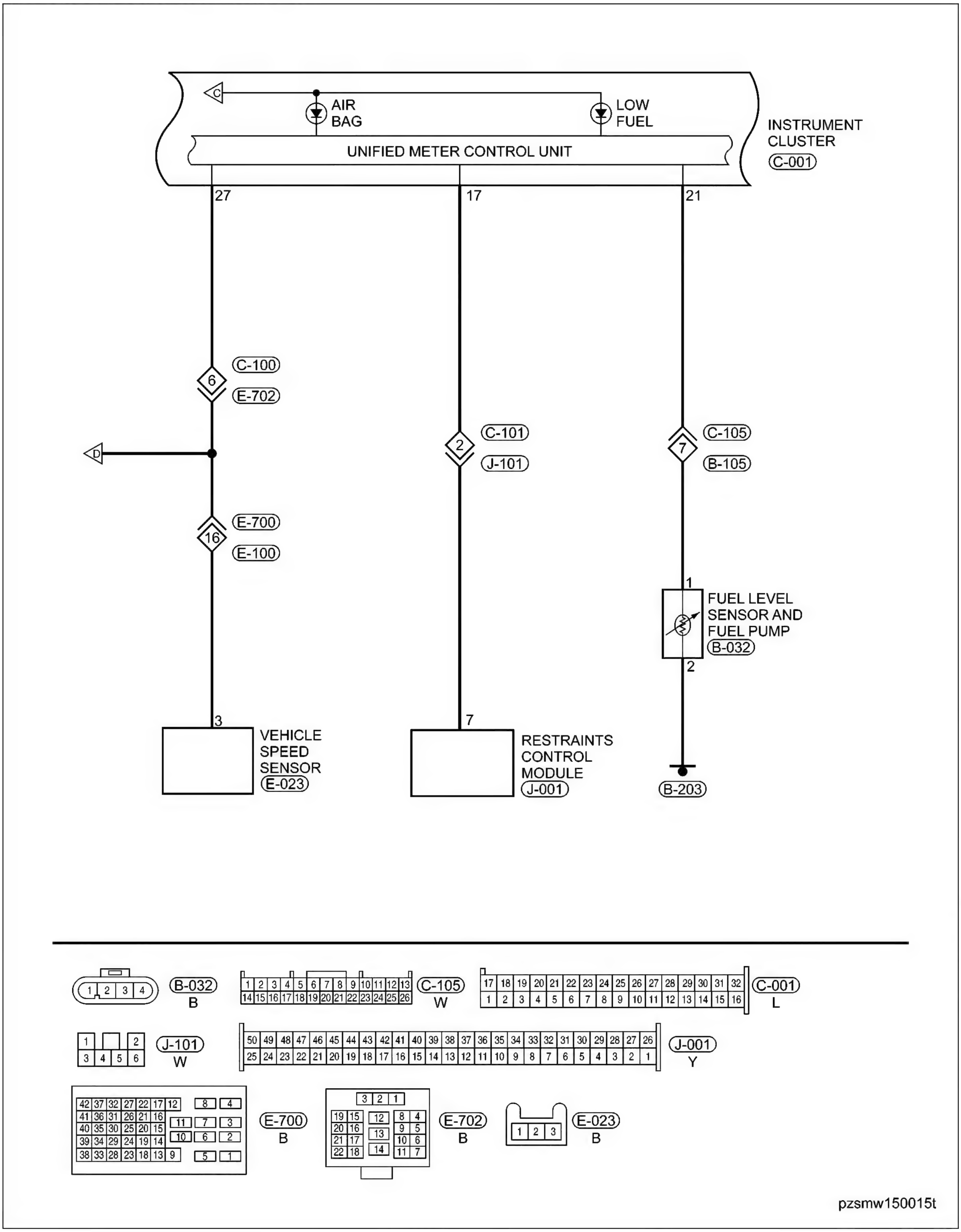

UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
PARK BRAKE
SEAT BELT
DOOR AJAR
18
19
1
C-105
B-105
10
18
11
1
ON
OFF
PARKING BRAKE SWITCH
B-015
2
UNFAS-TENED
FAS-TENED
SEAT BELT BUCKLE SWITCH
B-007
1
B-205
1
CLOSE
OPEN
FRONT DOOR UNLOCK SWITCH LH
B-042
1
CLOSE
OPEN
REAR DOOR UNLOCK SWITCH LH
B-043
1
CLOSE
OPEN
FRONT DOOR UNLOCK SWITCH RH
B-044
1
CLOSE
OPEN
REAR DOOR UNLOCK SWITCH RH
B-045
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-001
L
B-042, B-043, B-044, B-045
W W W W
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
C-105
W
B-015
W
1 2
B-007
W

pzsmw150013t

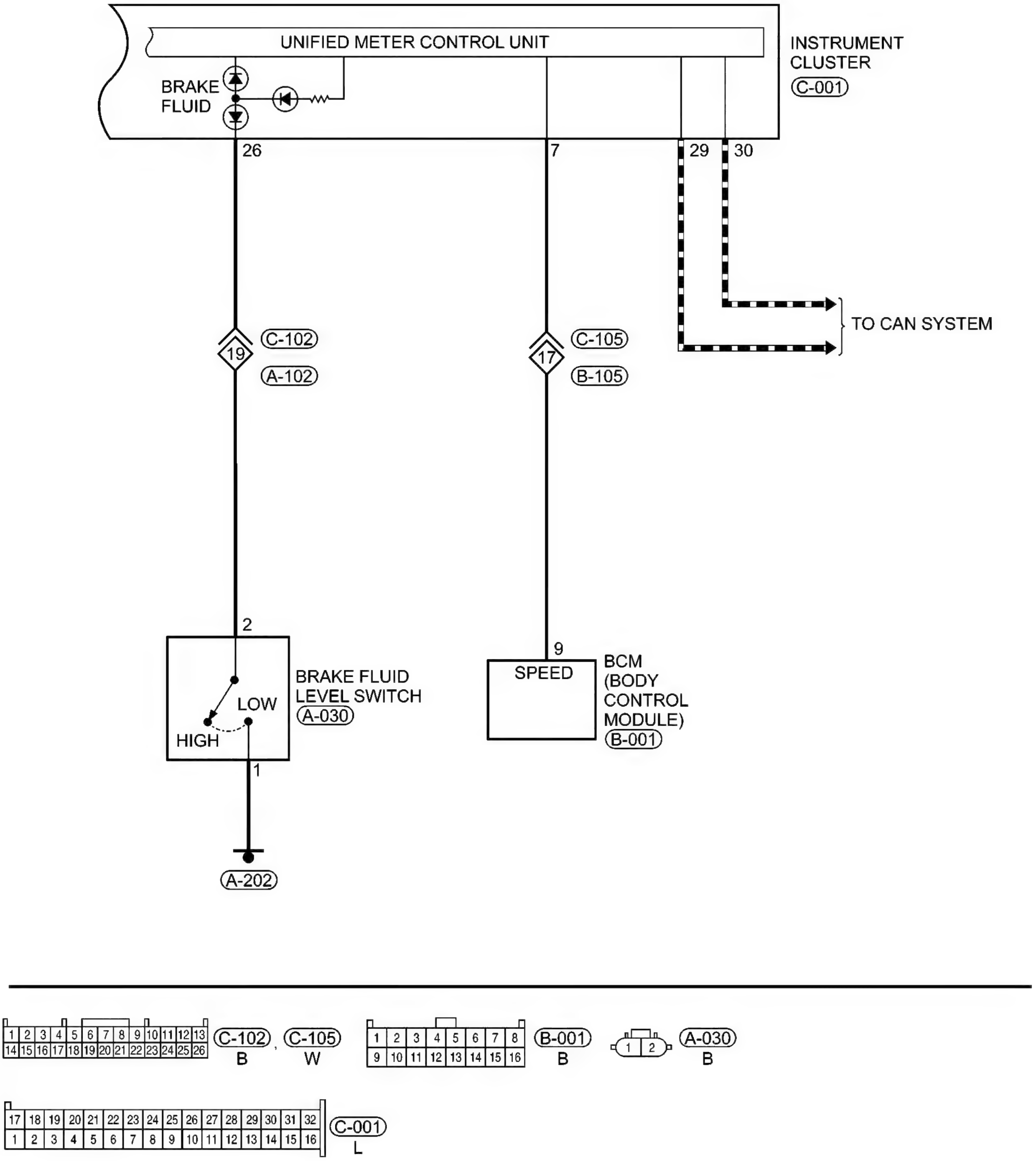
Instrument Cluster (Page 4 of 6)


LOW OIL
EPC
MIL
CHARGE
C
INSTRUMENT CLUSTER
C-001
UNIFIED METER CONTROL UNIT
9
16
2
20
23
10
5
3
C-204
C-203
C-100
E-702
1
3
17
4
5
2
E-700
E-100
12
41
D
1
OIL PRESSURE SWITCH
E-016
GENERATOR
E-008
11
31
9
8
59
EPC
MIL
TEMP OUT
EN-SP
VSS
ECM
E-601
E-601
B
E-008
W
E-016
W
C-001
L
E-702
B
E-700
B
pzsmw150014t

Instrument Cluster (Page 5 of 6)


C
AIR BAG
LOW FUEL
INSTRUMENT CLUSTER
C-001
UNIFIED METER CONTROL UNIT
27
17
21
6
C-100
E-702
D
16
E-700
E-100
2
C-101
J-101
7
C-105
B-105
1
FUEL LEVEL SENSOR AND FUEL PUMP
B-032
2
3
VEHICLE SPEED SENSOR
E-023
7
RESTRAINTS CONTROL MODULE
J-001
B-203
B-032
B
C-105
W
C-001
L
J-101
W
J-001
Y
E-700
B
E-702
B
E-023
B
pzsmw150015t

Instrument Cluster (Page 6 of 6)


UNIFIED METER CONTROL UNIT
INSTRUMENT CLUSTER
C-001
BRAKE FLUID
26
7
29
30
TO CAN SYSTEM
19
C-102
A-102
17
C-105
B-105
2
BRAKE FLUID LEVEL SWITCH
A-030
LOW
HIGH
1
A-202
9
SPEED
BCM (BODY CONTROL MODULE)
B-001
C-102, C-105
B
W
B-001
B
A-030
B
C-001
L

pzsmw150016t

Instrument Cluster Module Connector Pin-Out Table

PIN	CIRCUIT IDENTIFICATION	PIN	CIRCUIT IDENTIFICATION
1	-	17	-
2	Coolant Lever Sensor	18	Parking Brake Switch
3	GND (Power)	19	Seat Belt Buckle Switch LH
4	-	20	-
5	GND (Sensor)	21	Fuel Level Input
6	-	22	-
7	Speed Output	23	-
8	Reserve	24	-
9	Oil Pressure Switch	25	-
10	-	26	Brake Fluid Level Input
11	Continuous Supply Voltage	27	Vehicle Speed Input
12	Illumination Lamp	28	-
13	Ignition Switch	29	CAN-L
14	-	30	CAN-H
15	-	31	-
16	Charge	32	-

DIAGNOSIS & TESTING

Clearing Service Monitor Lamp

Perform the following to clear the service monitor lamp:

1. Turn the ignition switch off.
2. Press down and hold the Mode switch.
3. Turn the ignition switch on.
4. Release the Mode switch.
5. Touch the Mode switch and the Clock switch simultaneously in 30 seconds with a touch time less than 2 seconds to clear the mileage maintenance identification.

Diagnostic Help

1. The X-431 scan tool connects to the Data Link Connector (DLC) and communicates with the vehicle electronic modules through the data network.
2. Use a digital multimeter to perform voltage readings on electronic systems.
3. Visually inspect the related electrical wiring harness.

Intermittent Troubleshooting

If the failure is intermittent perform the following:

- Check for loose connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Monitor the scan tool data relative to this circuit.
- Wiggle the related wiring harness and connectors while looking for an interrupted signal on the affected circuit.
- Look for broken, bent, pushed out or corroded terminals.
- Inspect the sensor and mounting area for any condition that would result in an incorrect signal, such as damage or foreign material.

Ground Inspection

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This added resistance can alter the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can effect the circuit. Perform the following when inspecting a ground connection:

1. Remove the ground bolt or screw.
2. Inspect all mating surface for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for ″add-on″ accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are crimped to one eyelet, make sure no excess wire insulation has been crimped creating a bad ground.

Diagnostic Tools

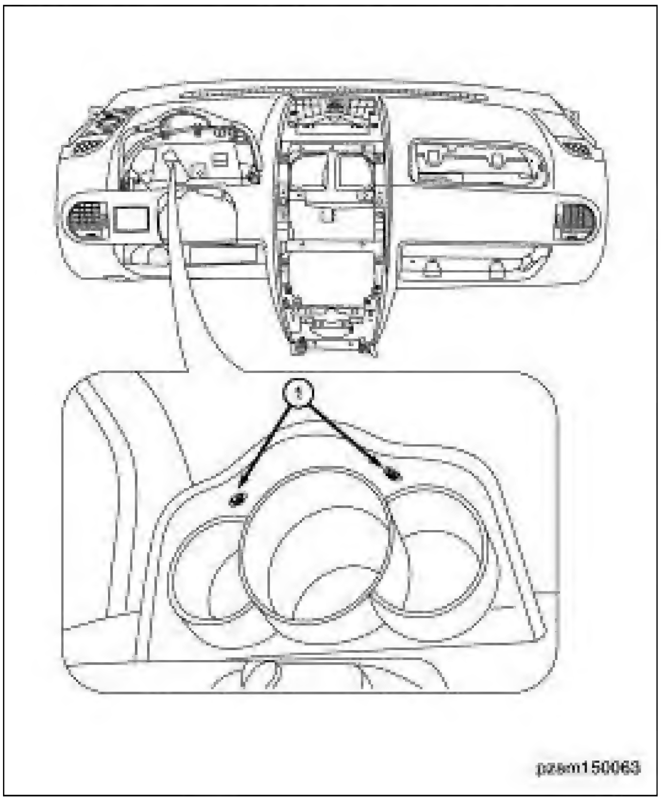
- Digital Multimeter
- Jumper Wire

ON-VEHICLE SERVICE

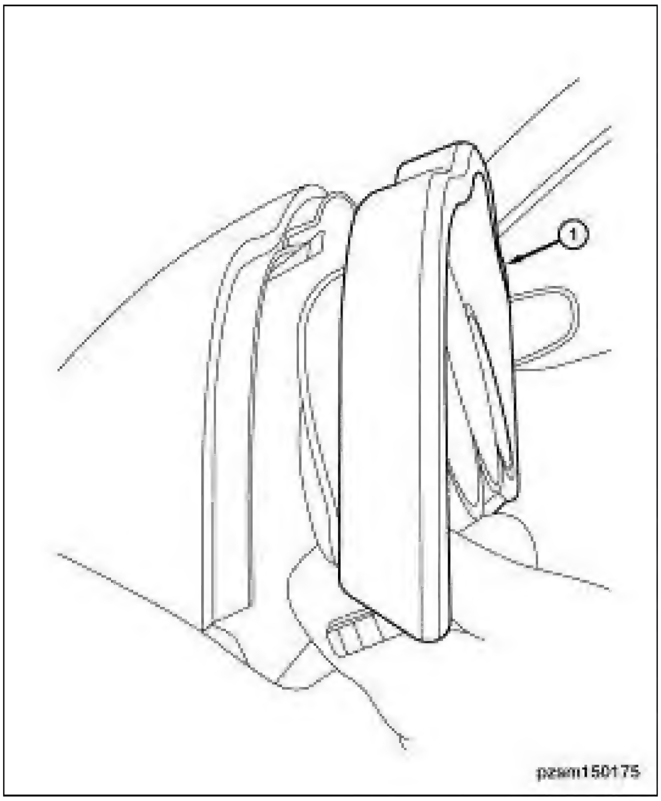
Instrument Cluster

Removal & Installation

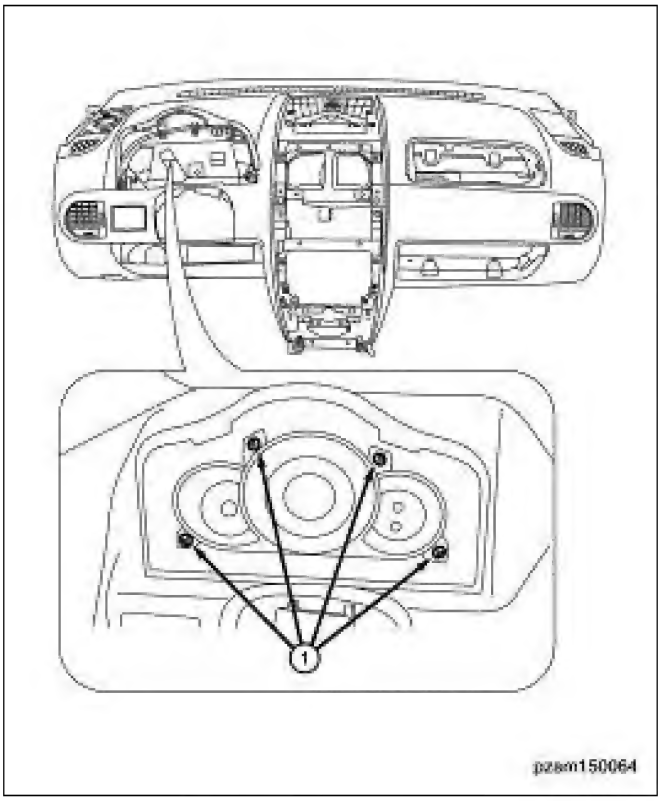
1. Disconnect the negative battery cable.
2. Remove the steering wheel (See Steering Wheel Removal & Installation in Section 11 Steering).
3. Remove the two instrument cluster cover retaining screws (1).



4. Remove the instrument cluster cover (1).



5. Remove the retaining screws (1) around the cluster.



6. Disconnect the instrument cluster electrical connector.
7. Remove the instrument cluster.
8. Installation is in the reverse order of removal.

INTERIOR LAMPS

Description

The interior lamps are controlled by the Body Control Module (BCM). The interior lamps consist of the following:

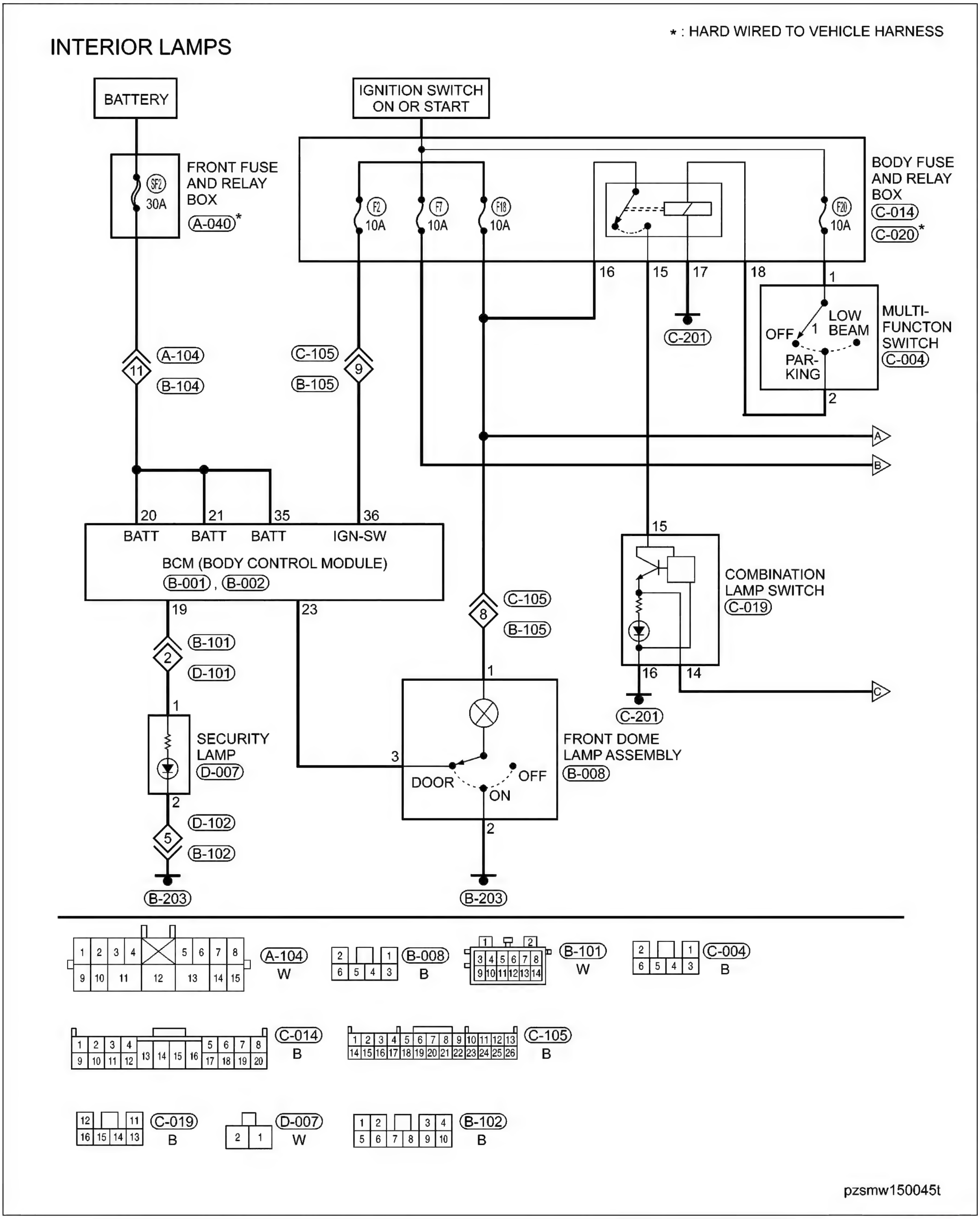
- Front Dome Lamp
- Backlight Adjusting Switch
- Instrument Cluster
- Headlamp Aiming Switch
- Combination Lamp Switch
- Hazard Switch
- Console Power Socket (Illumination)
- Audio Unit
- Door Mirror Remote Control Switch
- Main Power Window Switch
- Front Power Window Switch
- Rear Power Window Switch
- Rear Hatch Lamp

Operation

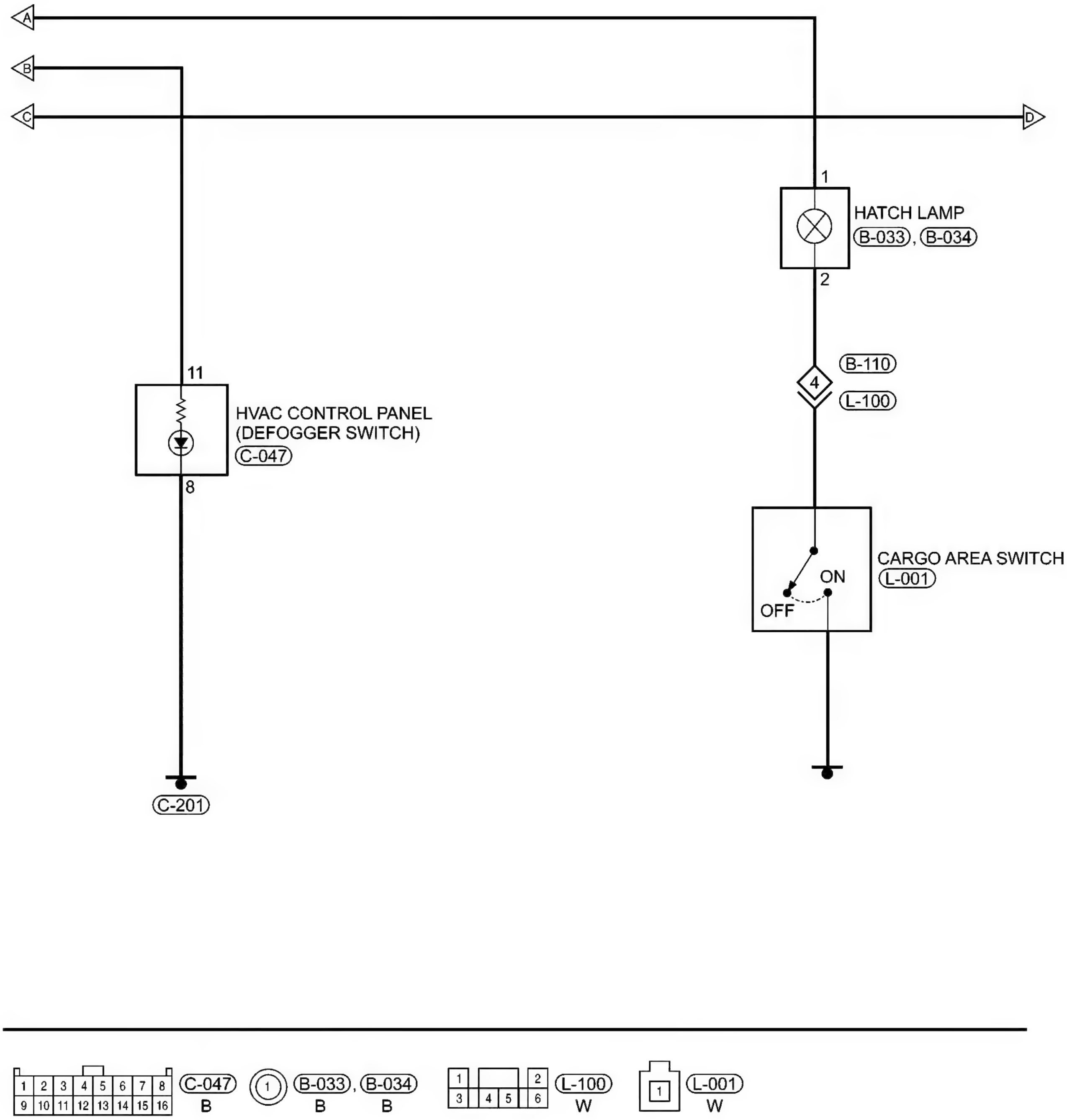
The Body Control Module (BCM) receives switch inputs and controls voltage output to the interior lamps. The supply voltage is transmitted from the fuse box to the lamps.

Electrical Schematics

Interior Lamps (Page 1 of 5)

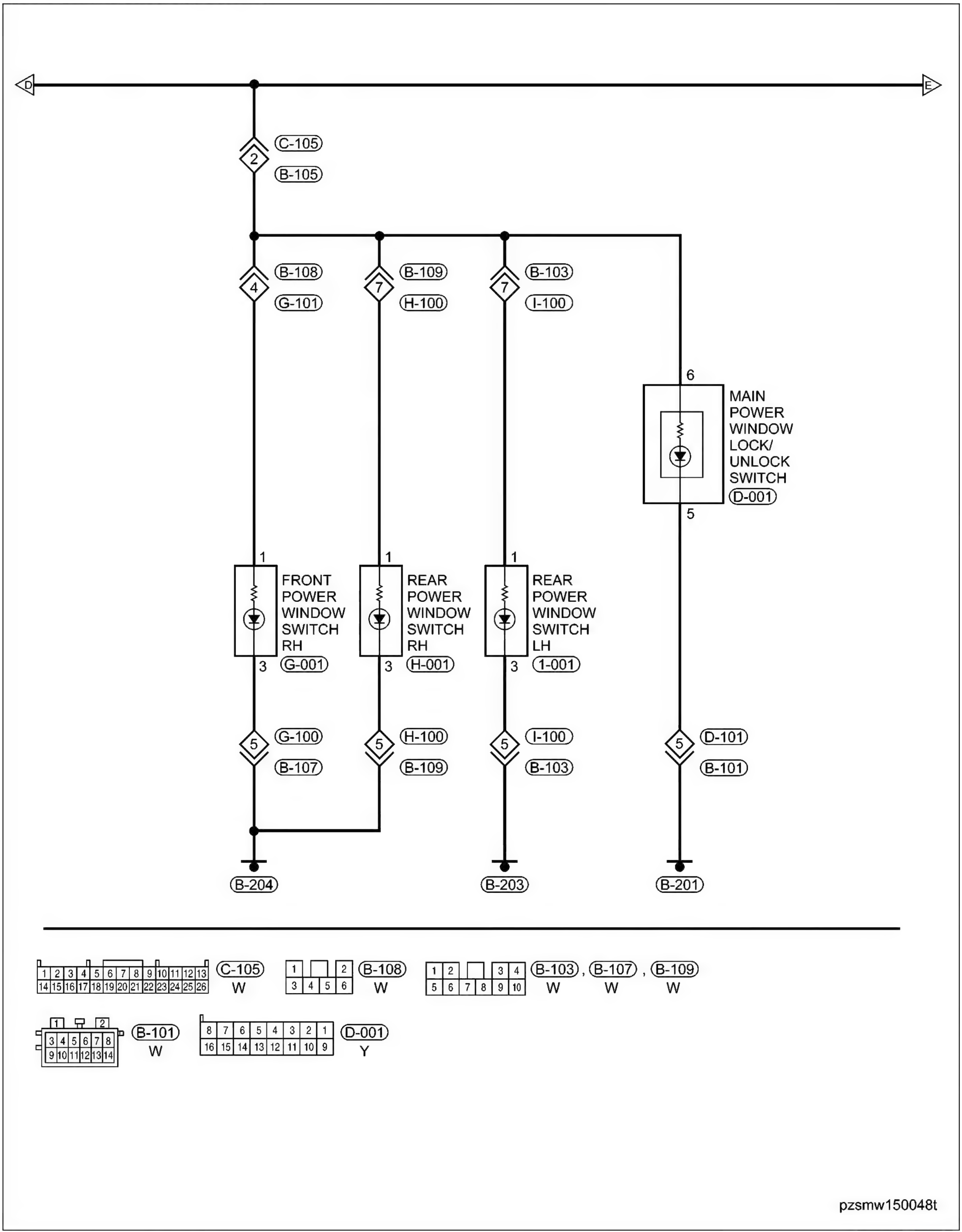

INTERIOR LAMPS
*: HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
FRONT FUSE AND RELAY BOX
A-040*
SF2 30A
F2 10A
F7 10A
F18 10A
F20 10A
BODY FUSE AND RELAY BOX
C-014
C-020*
16
15
17
18
1
C-201
MULTI-FUNCTON SWITCH
C-004
LOW BEAM
OFF
1
PAR-KING
2
A-104
11
B-104
C-105
9
B-105
A
B
20
21
35
36
BATT
BATT
BATT
IGN-SW
BCM (BODY CONTROL MODULE)
B-001, B-002
19
23
B-101
2
D-101
1
SECURITY LAMP
D-007
2
D-102
5
B-102
B-203
C-105
8
B-105
1
FRONT DOME LAMP ASSEMBLY
B-008
3
DOOR
OFF
ON
2
B-203
15
COMBINATION LAMP SWITCH
C-019
16
14
C-201
C
A-104 W
B-008 B
B-101 W
C-004 B
C-014 B
C-105 B
C-019 B
D-007 W
B-102 B
pzsmw150045t

Interior Lamps (Page 2 of 5)

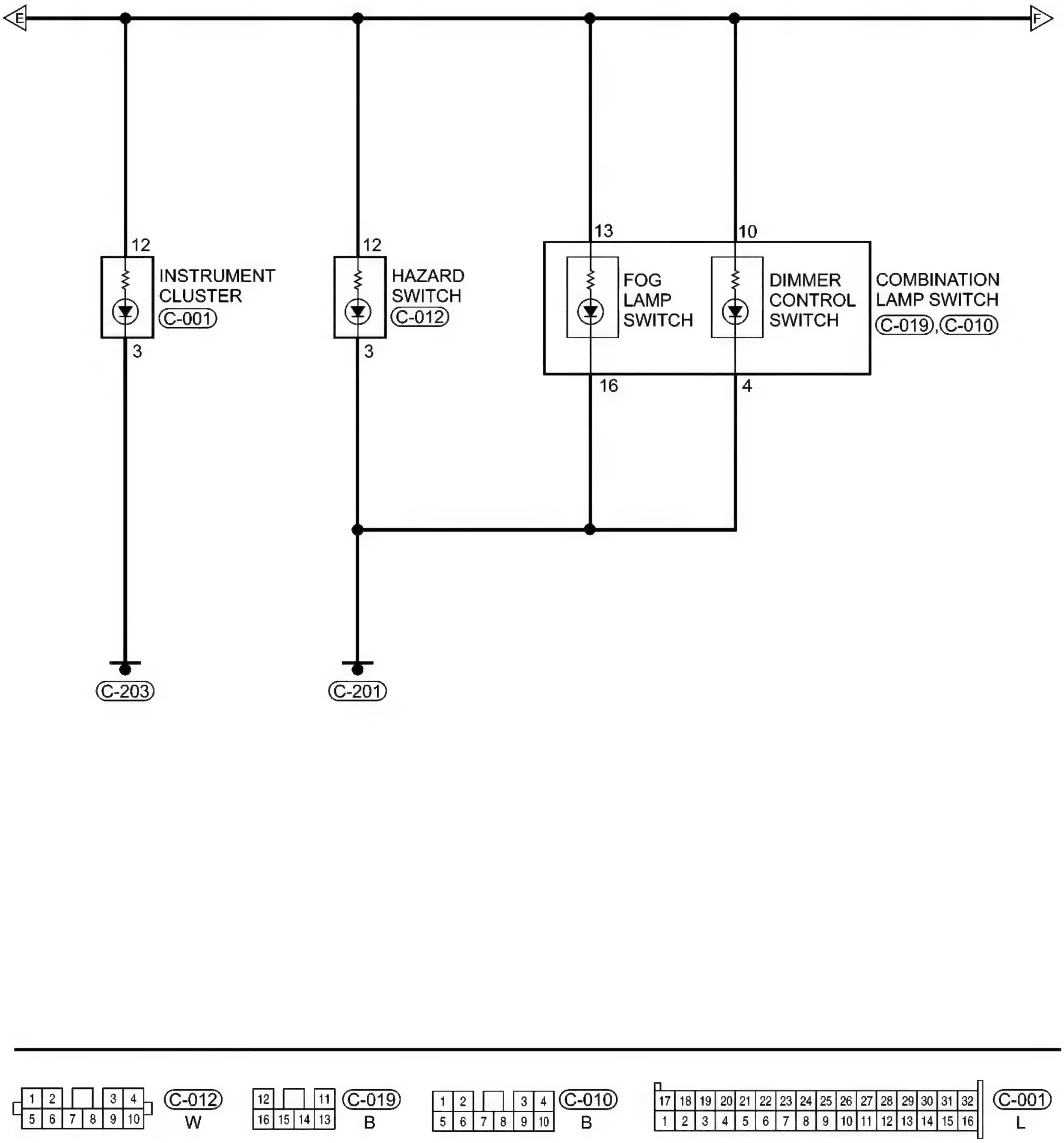

A
B
C
D
1
HATCH LAMP
B-033, B-034
2
B-110
4
L-100
11
HVAC CONTROL PANEL
(DEFOGGER SWITCH)
C-047
8
CARGO AREA SWITCH
L-001
ON
OFF
C-201
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
C-047
B
1
B-033, B-034
B B
1 2
3 4 5 6
L-100
W
1
L-001
W

pzsmw150046t

Interior Lamps (Page 3 of 5)

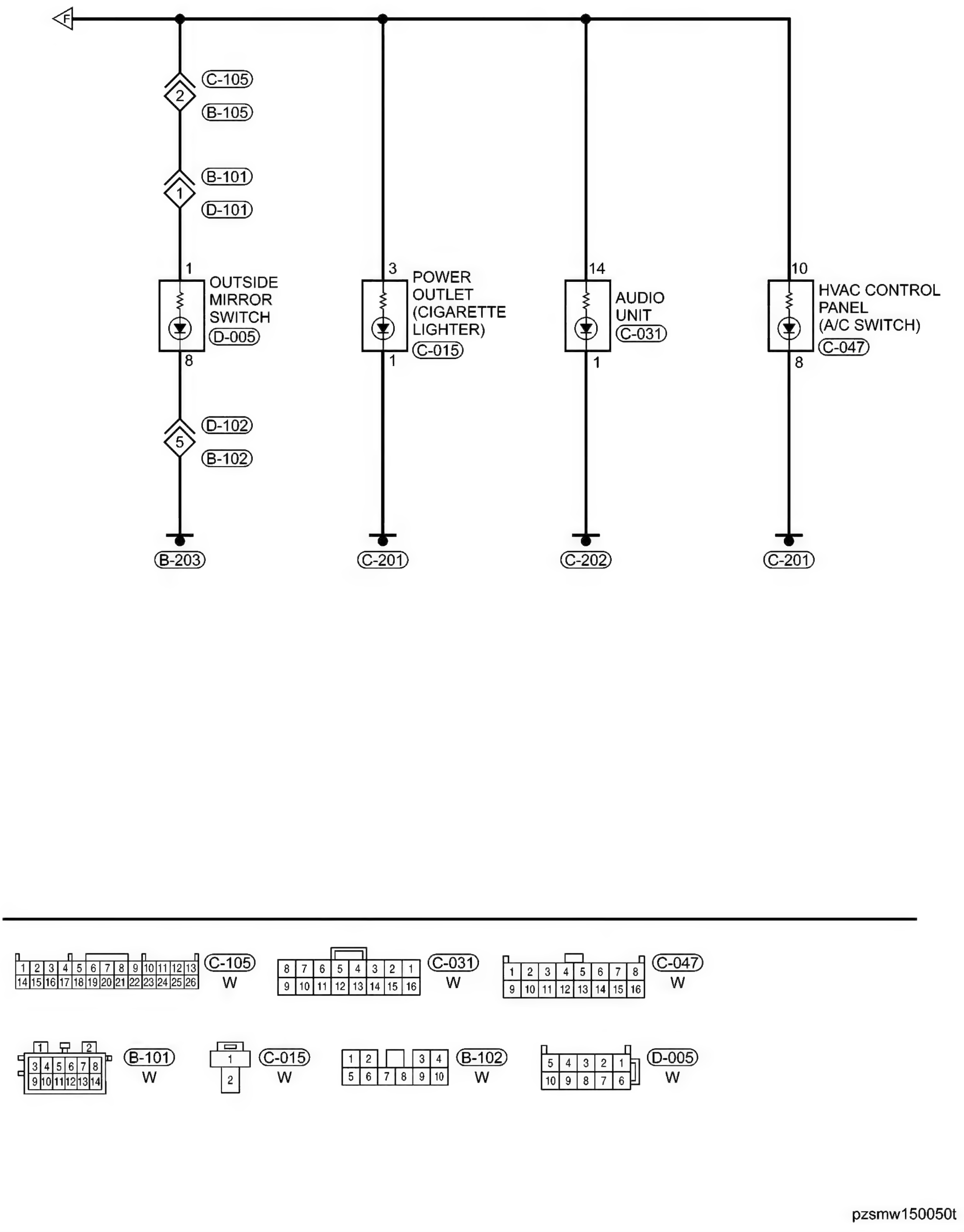

D
E
C-105
2
B-105
B-108
4
G-101
B-109
7
H-100
B-103
7
I-100
6
MAIN POWER WINDOW LOCK/ UNLOCK SWITCH
D-001
5
1
FRONT POWER WINDOW SWITCH RH
3
G-001
1
REAR POWER WINDOW SWITCH RH
3
H-001
1
REAR POWER WINDOW SWITCH LH
3
1-001
G-100
5
B-107
H-100
5
B-109
I-100
5
B-103
D-101
5
B-101
B-204
B-203
B-201
C-105
W
B-108
W
B-103, B-107, B-109
W W W
B-101
W
D-001
Y
pzsmw150048t

Interior Lamps (Page 4 of 5)


E
F
12
INSTRUMENT
CLUSTER
C-001
3
12
HAZARD
SWITCH
C-012
3
13
10
FOG
LAMP
SWITCH
DIMMER
CONTROL
SWITCH
COMBINATION
LAMP SWITCH
C-019, C-010
16
4
C-203
C-201
C-012
W
C-019
B
C-010
B
C-001
L

pzsmw150049t

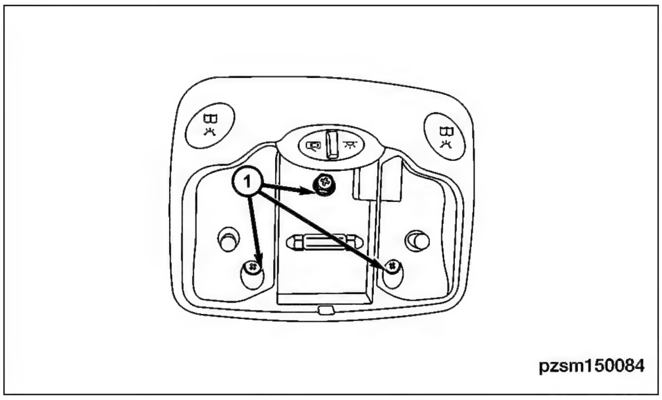
Interior Lamps (Page 5 of 5)


F
C-105
2
B-105
B-101
1
D-101
1
OUTSIDE MIRROR SWITCH
D-005
8
D-102
5
B-102
B-203
3
POWER OUTLET (CIGARETTE LIGHTER)
C-015
1
C-201
14
AUDIO UNIT
C-031
1
C-202
10
HVAC CONTROL PANEL (A/C SWITCH)
C-047
8
C-201
C-105
W
C-031
W
C-047
W
B-101
W
C-015
W
B-102
W
D-005
W
pzsmw150050t

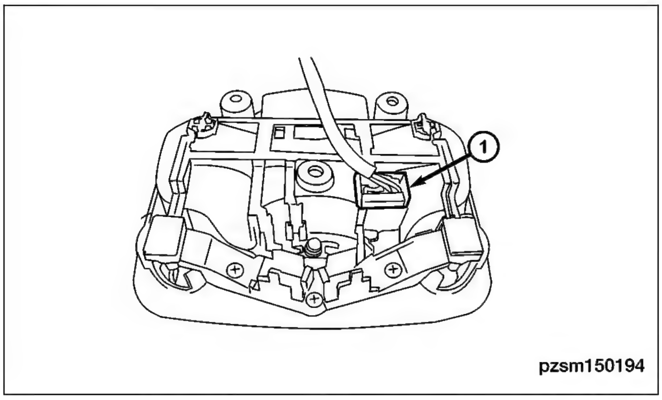
Front Dome Lamp Assembly

Removal & Installation

1. Turn the ignition switch off.
2. Using a trim tool, remove the lamp cover.
3. Remove the lamp retaining screws (1).



4. Disconnect the electrical connector (1).



5. Remove the front dome lamp assembly.
6. Installation is in the reverse order of removal.

POWER OUTLET

Description

There are two 12 volt electrical outlets. One is under the center console which is used for the cigarette lighter. The other is located on the right trim panel, near the front passenger area.

CAUTION:

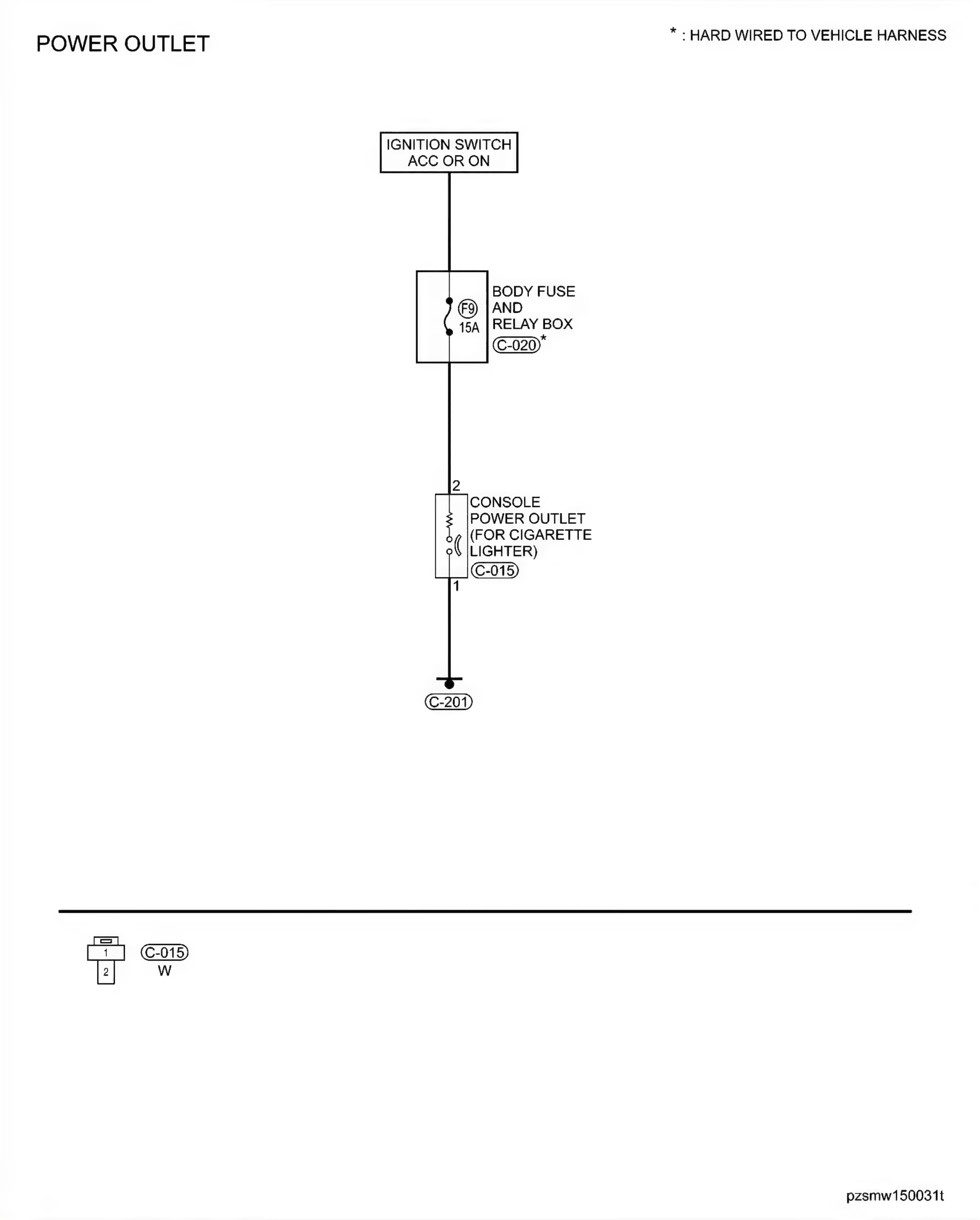
This power outlet is designed for 12V (120W) only. Do not use any type of accessory above this rating.

Operation

The power outlet is powered when the ignition switch is on the ACC/ON position.

Electrical Schematics

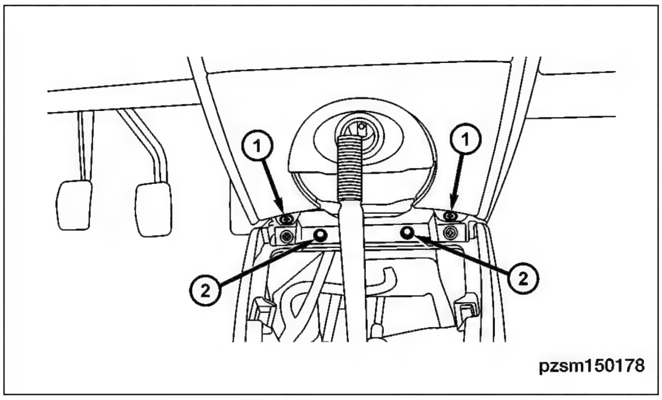
Power Outlet (Page 1 of 1)


POWER OUTLET
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ACC OR ON
F9
15A
BODY FUSE AND RELAY BOX
C-020*
2
CONSOLE POWER OUTLET (FOR CIGARETTE LIGHTER)
C-015
1
C-201
1
2
C-015
W
pzsmw150031t

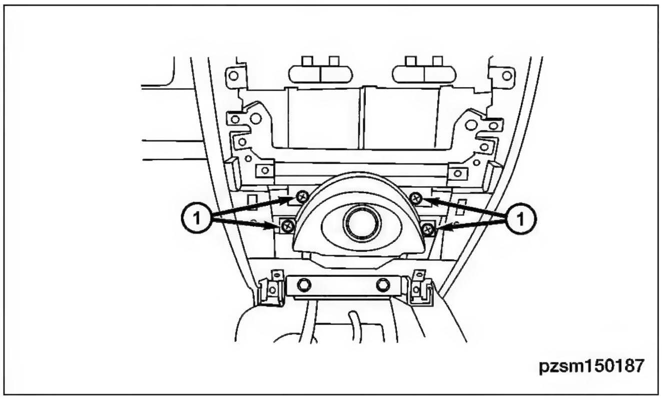
Power Outlet

Removal & Installation

1. Turn the ignition switch off.
2. Remove the lower console (See Lower Console Removal & Installation in Section 15 Body & Accessories).
3. Remove the two power outlet panel retaining screws (1).



4. Remove the power outlet panel.
5. Remove the four power outlet retaining screws (1).



6. Disconnect the power outlet electrical connector.
7. Remove the power outlet.
8. Installation is in the reverse order of removal.

POWER WINDOWS

Description

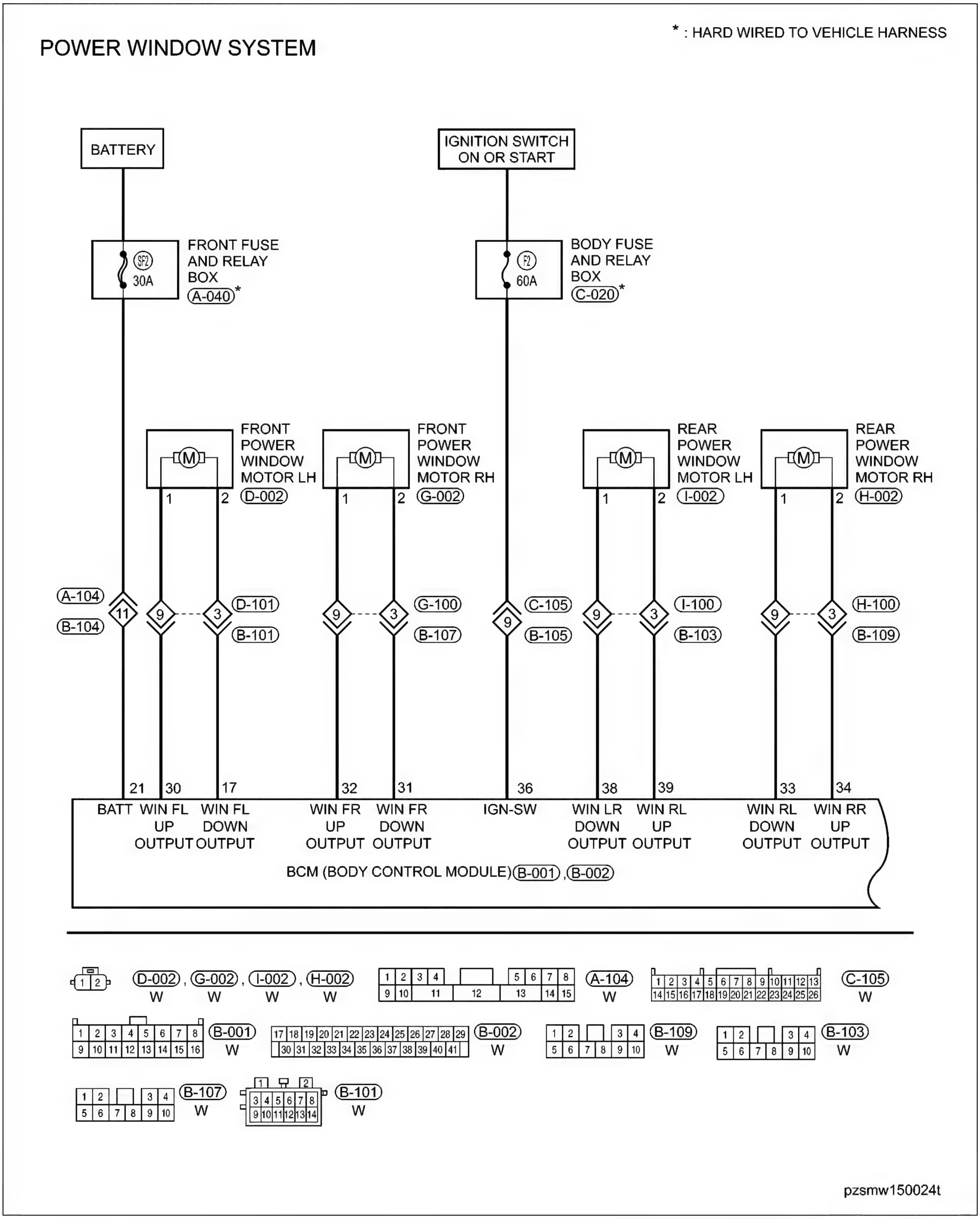
The power window system allows each of the door windows to be raised and lowered electronically by activating a switch on each door trim panel. The driver's window switch allows the driver to lock out the individual rear window switches from operation. The power window system includes the power window switches on the driver's door trim panel, passenger door and rear doors, and the power window motors.

Operation

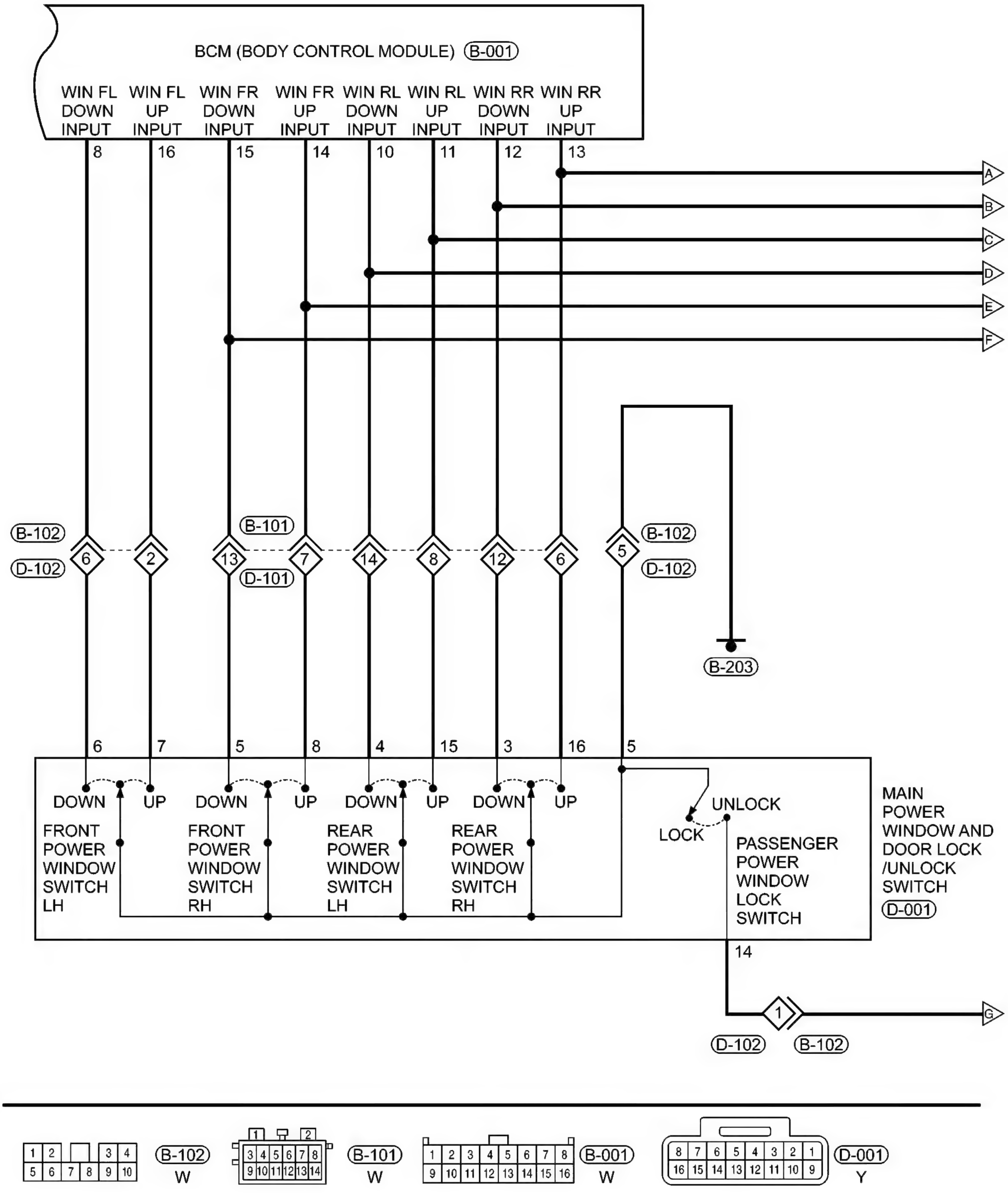
The front and rear power window motors are a permanent magnet type. A battery positive and negative connection to either of the two motor terminals will cause the motor to rotate in one direction. Reversing current through these same two connections will cause the motor to rotate in the opposite direction. Each individual motor is grounded through their respective switch.

Electrical Schematics

Power Window System (Page 1 of 3)

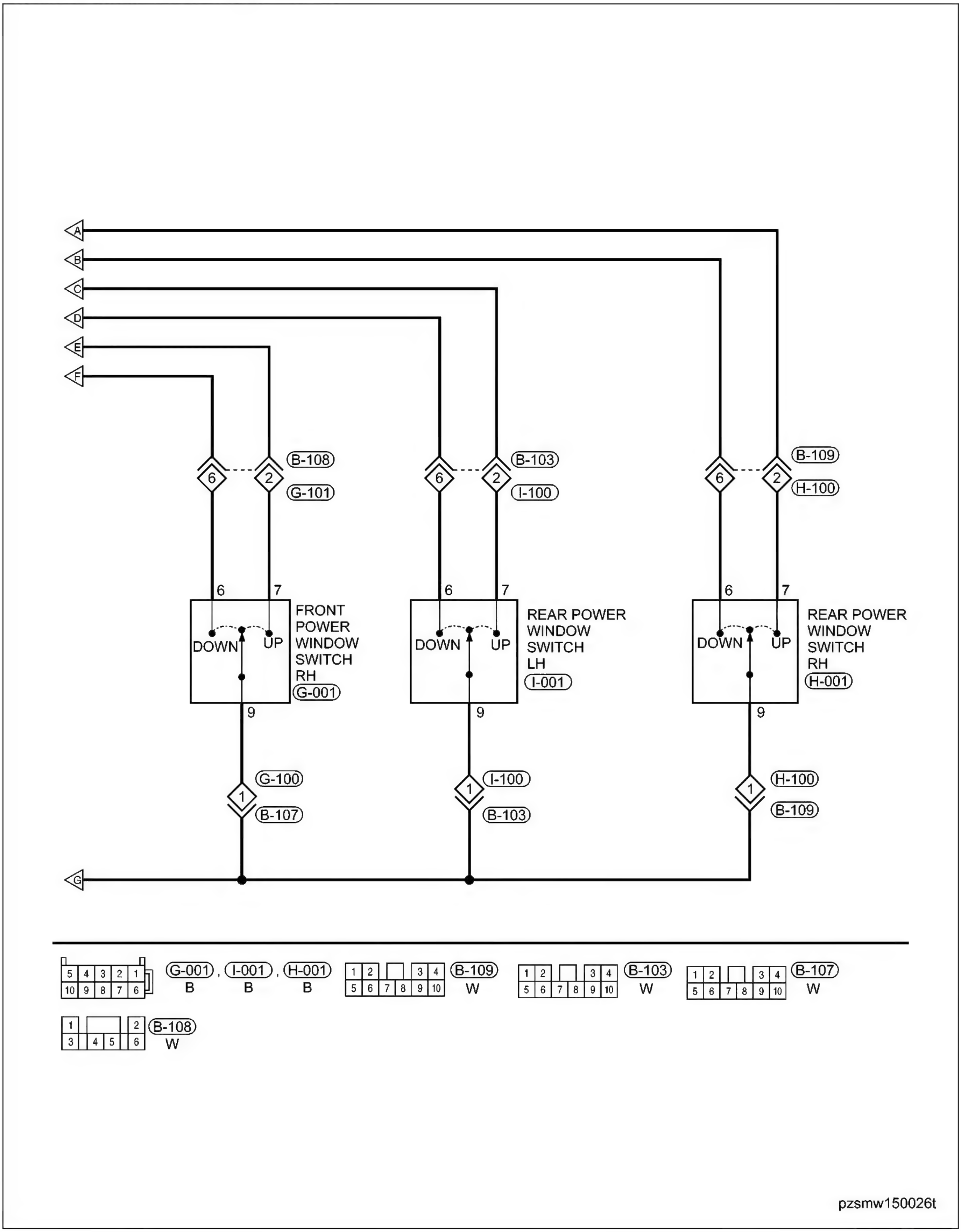

POWER WINDOW SYSTEM
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
SF2
30A
FRONT FUSE AND RELAY BOX
A-040*
F2
60A
BODY FUSE AND RELAY BOX
C-020*
M
FRONT POWER WINDOW MOTOR LH
D-002
FRONT POWER WINDOW MOTOR RH
G-002
REAR POWER WINDOW MOTOR LH
I-002
REAR POWER WINDOW MOTOR RH
H-002
1
2
A-104
B-104
11
9
3
D-101
B-101
G-100
B-107
C-105
B-105
I-100
B-103
H-100
B-109
21
30
17
32
31
36
38
39
33
34
BATT
WIN FL UP OUTPUT
WIN FL DOWN OUTPUT
WIN FR UP OUTPUT
WIN FR DOWN OUTPUT
IGN-SW
WIN LR DOWN OUTPUT
WIN RL UP OUTPUT
WIN RL DOWN OUTPUT
WIN RR UP OUTPUT
BCM (BODY CONTROL MODULE) B-001 , B-002
D-002 , G-002 , I-002 , H-002
W W W W
A-104
W
C-105
W
B-001
W
B-002
W
B-109
W
B-103
W
B-107
W
B-101
W
pzsmw150024t

Power Window System (Page 2 of 3)


BCM (BODY CONTROL MODULE) B-001
WIN FL DOWN INPUT
WIN FL UP INPUT
WIN FR DOWN INPUT
WIN FR UP INPUT
WIN RL DOWN INPUT
WIN RL UP INPUT
WIN RR DOWN INPUT
WIN RR UP INPUT
8
16
15
14
10
11
12
13
A
B
C
D
E
F
B-102
D-102
B-101
D-101
6
2
13
7
14
8
12
6
5
B-102
D-102
B-203
6
7
5
8
4
15
3
16
5
DOWN
UP
DOWN
UP
DOWN
UP
DOWN
UP
FRONT POWER WINDOW SWITCH LH
FRONT POWER WINDOW SWITCH RH
REAR POWER WINDOW SWITCH LH
REAR POWER WINDOW SWITCH RH
UNLOCK
LOCK
PASSENGER POWER WINDOW LOCK SWITCH
MAIN POWER WINDOW AND DOOR LOCK /UNLOCK SWITCH
D-001
14
1
G
D-102
B-102
1 2 3 4
5 6 7 8 9 10
B-102
W
1 2
3 4 5 6 7 8
9 10 11 12 13 14
B-101
W
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B-001
W
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
D-001
Y

pzsmw150025t

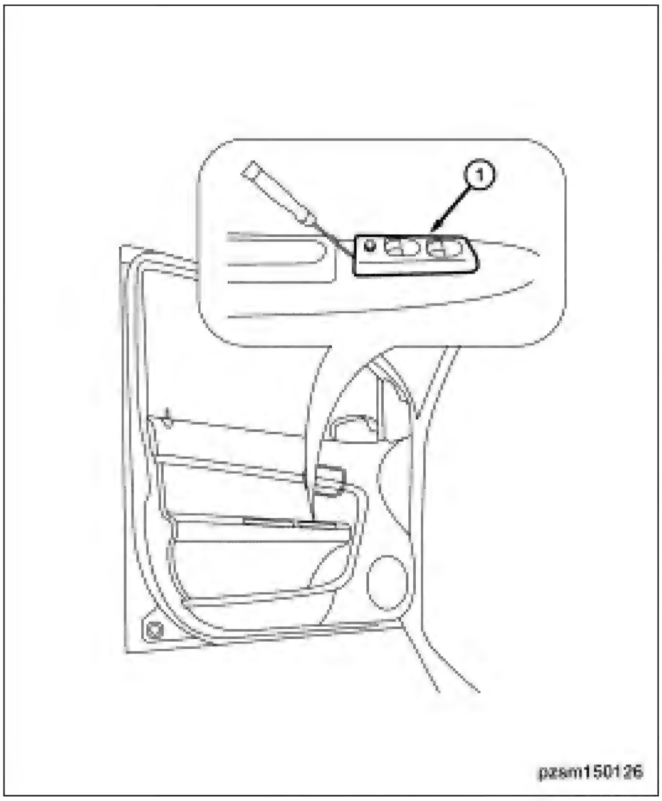
Power Window System (Page 3 of 3)


A
B
C
D
E
F
G
6
2
B-108
G-101
6
2
B-103
I-100
6
2
B-109
H-100
6
7
FRONT POWER WINDOW SWITCH RH
G-001
DOWN
UP
9
6
7
REAR POWER WINDOW SWITCH LH
I-001
DOWN
UP
9
6
7
REAR POWER WINDOW SWITCH RH
H-001
DOWN
UP
9
G-100
1
B-107
I-100
1
B-103
H-100
1
B-109
5 4 3 2 1
10 9 8 7 6
G-001, I-001, H-001
B B B
1 2 3 4
5 6 7 8 9 10
B-109
W
1 2 3 4
5 6 7 8 9 10
B-103
W
1 2 3 4
5 6 7 8 9 10
B-107
W
1 2
3 4 5 6
B-108
W
pzsmw150026t

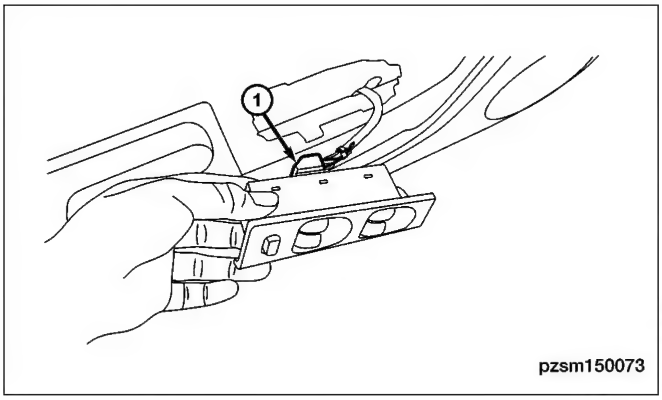
Power Window Switch

Removal & Installation

1. Turn the ignition switch off.
2. Using a trim stick, remove the power window switch assembly (1) on the left front door.



3. Disconnect the power window switch electrical connector (1).



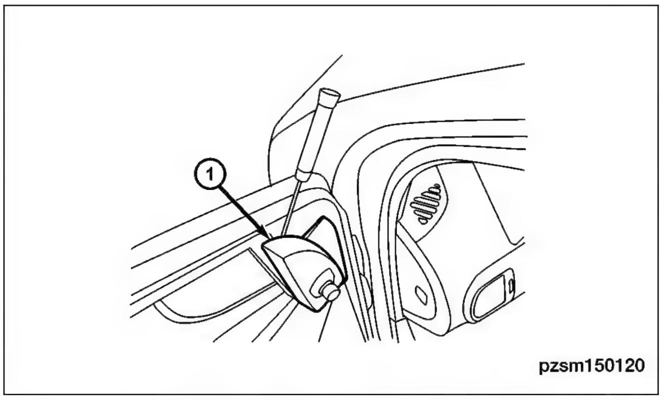
4. Remove the power window switch assembly.
5. Installation is in the reverse order of removal.

Power Window Motor

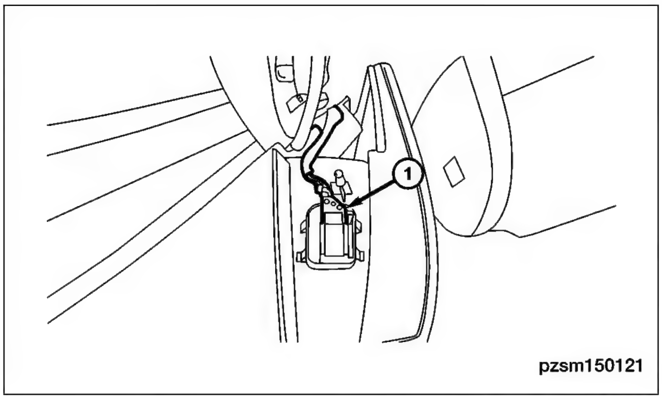
Removal & Installation

1. Turn the ignition switch off.

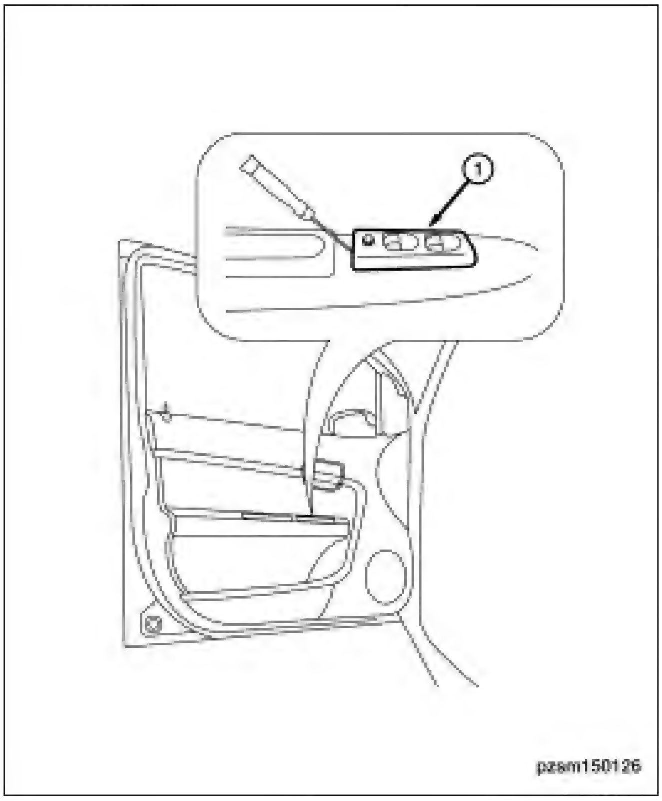
2. Using a trim stick, remove the outside mirror switch panel (1) from the door trim panel.


1
pzsm150120

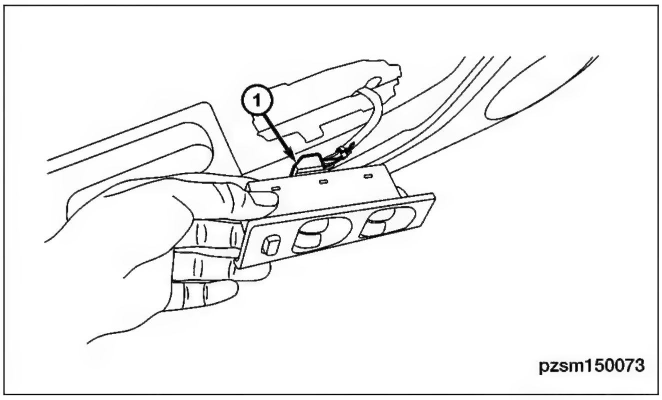
3. Disconnect the outside mirror switch electrical connector (1).


1
pzsm150121

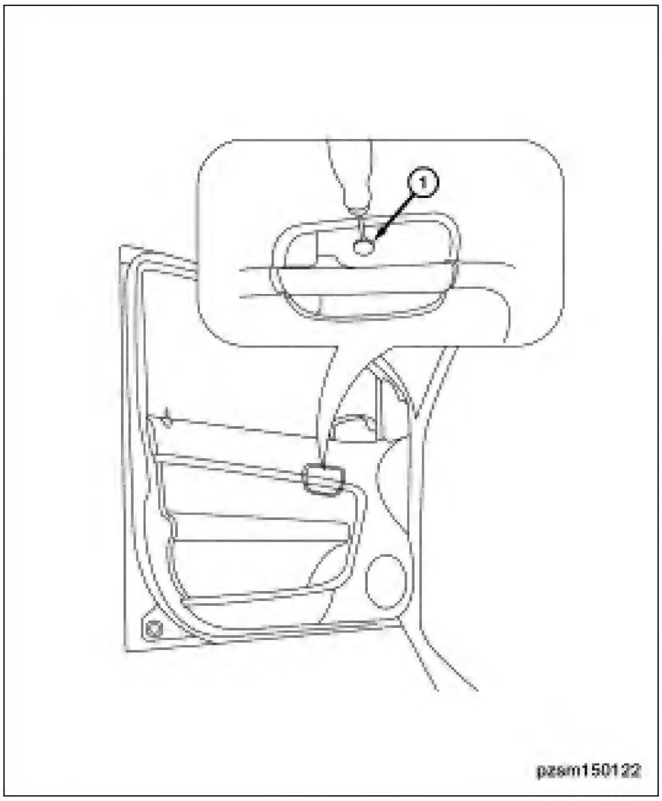
4. Using a trim stick, remove the power window switch assembly (1) on the left front door.


1
pzsm150126

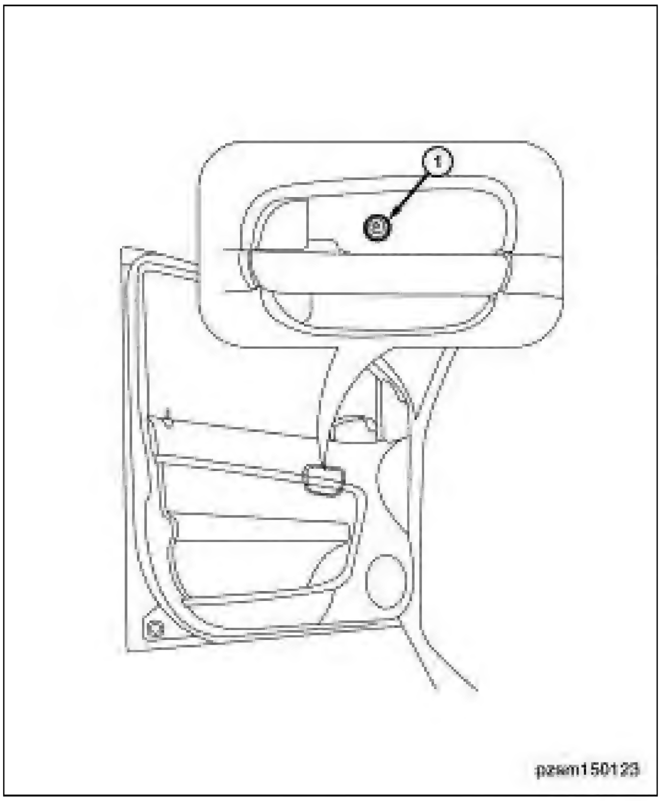
5. Disconnect the power window switch electrical connector (1).


1
pzsm150073

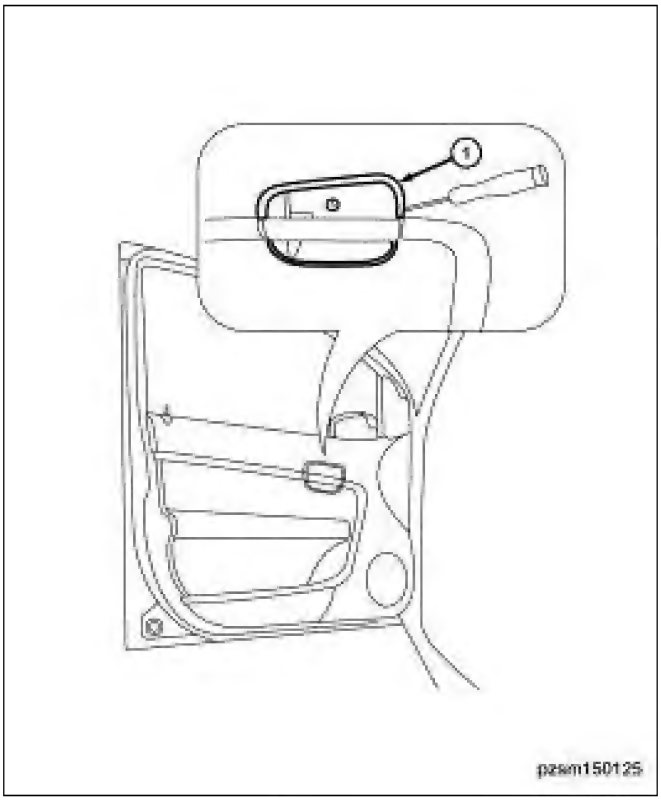
6. Using a trim stick, remove the inside door handle panel retaining screw cover (1).


1
pzsm150122

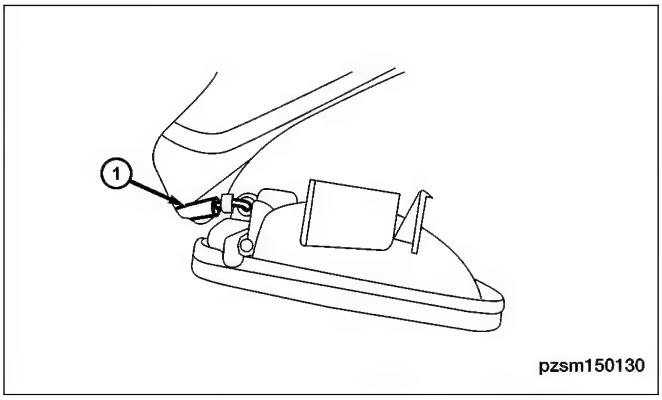
7. Remove the inside door handle panel retaining screw (1).


1
pzsm150123

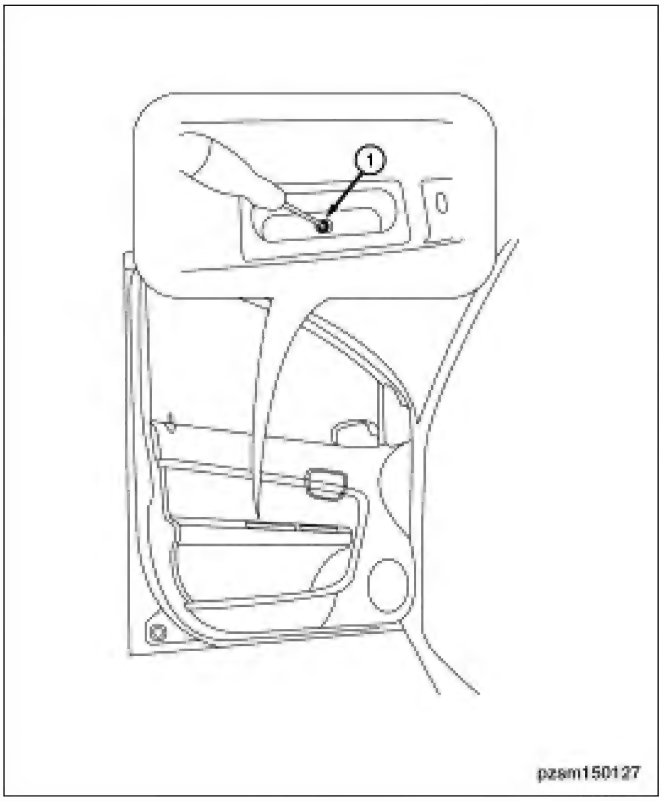
8. Remove the inside door handle panel (1).


1
pzsm150125

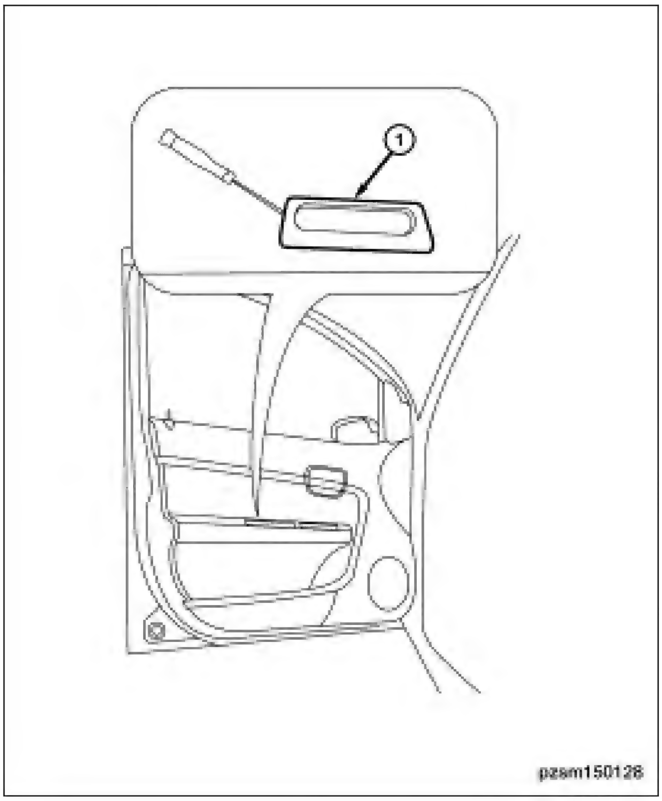
9. Loosen the inside door handle panel control cable (1).


1
pzsm150130

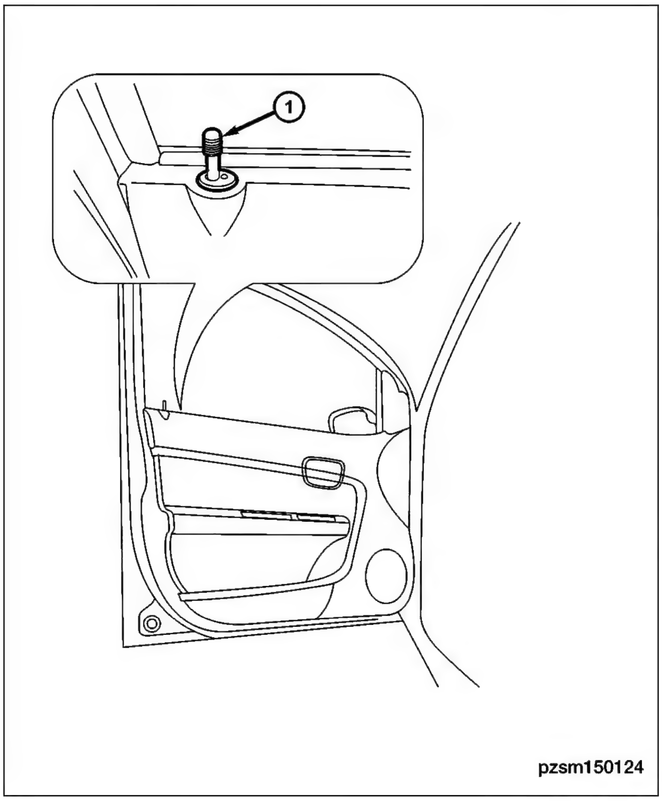
10. Remove the small storage compartment retaining screw (1) on the door trim panel.


1
pzsm150127

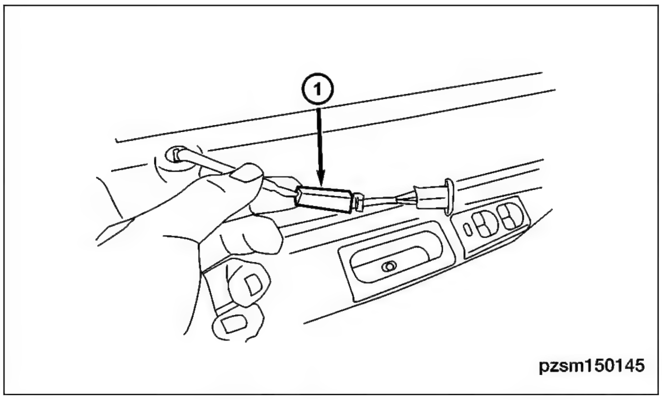
11. Using a trim stick, remove the small storage compartment (1).


1
pzsm150128

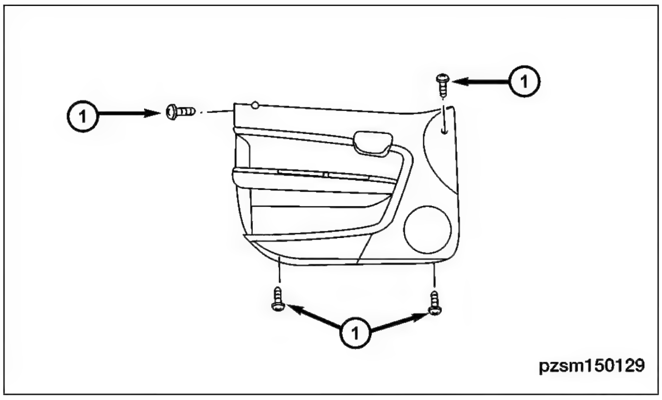
12. Remove the door switch (1).


1
pzsm150124

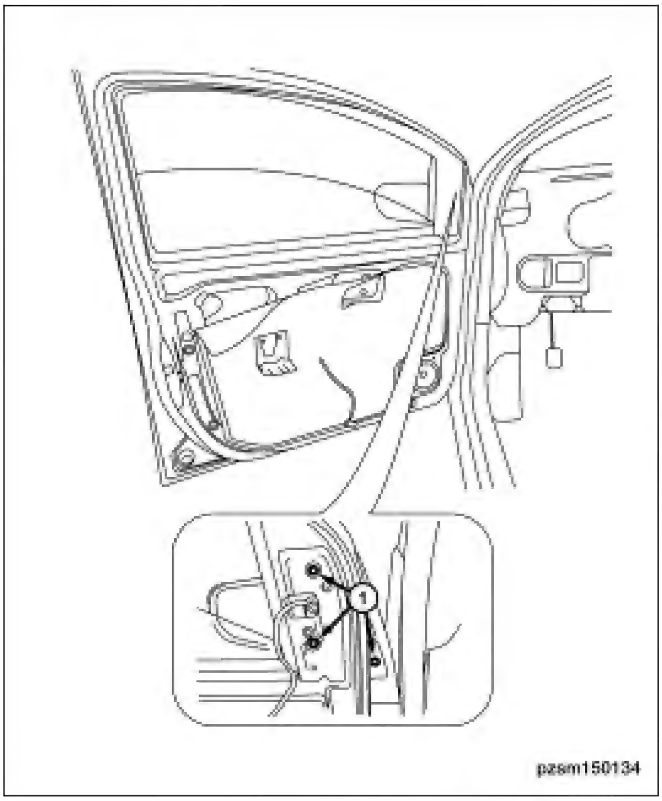
13. Disconnect the door switch electrical connector (1).


1
pzsm150145

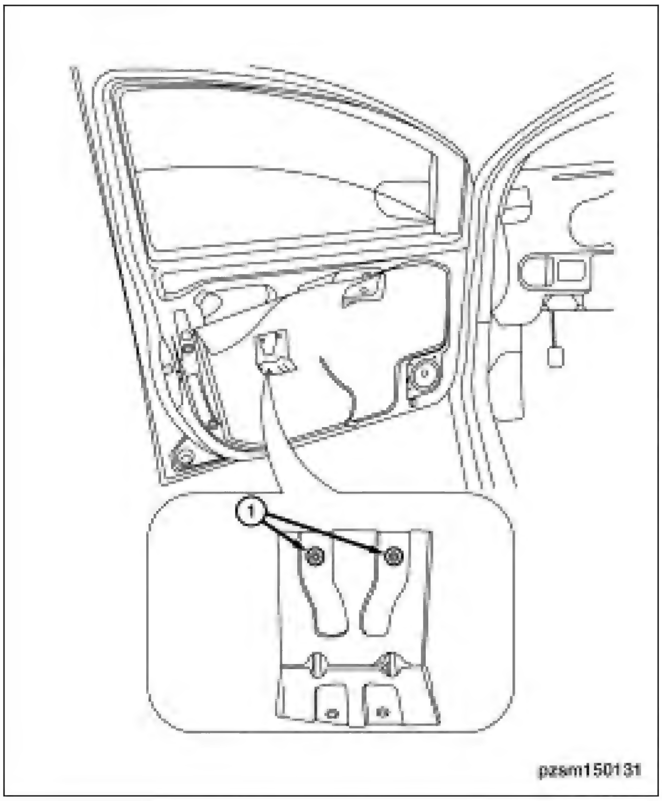
14. Remove the four door trim panel retaining screws (1).


1
1
1
pzsm150129

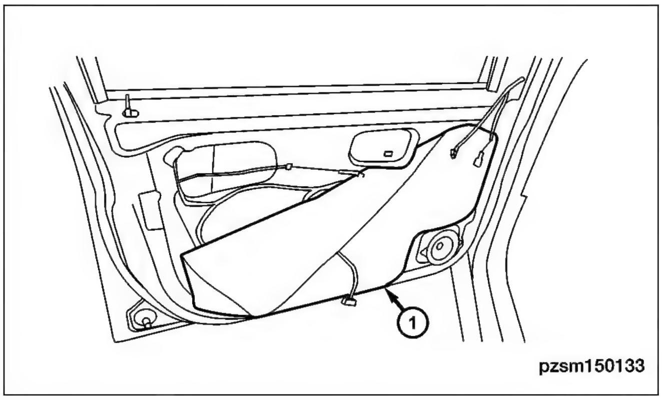
15. Remove the door trim panel.
16. Remove the outside mirror retaining nuts (1), and remove the outside mirror electrical connector. (Tighten: Outside mirror retaining nuts to 7 ± 1 N·m)


1
pzsm150134

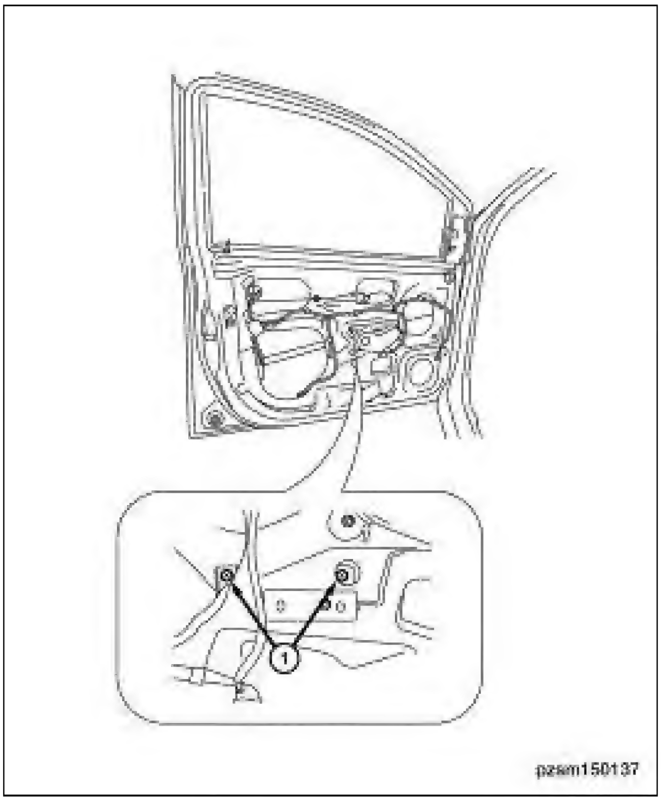
17. Remove the two door trim panel mounting bracket retaining screws (1).


1
pzsm150131

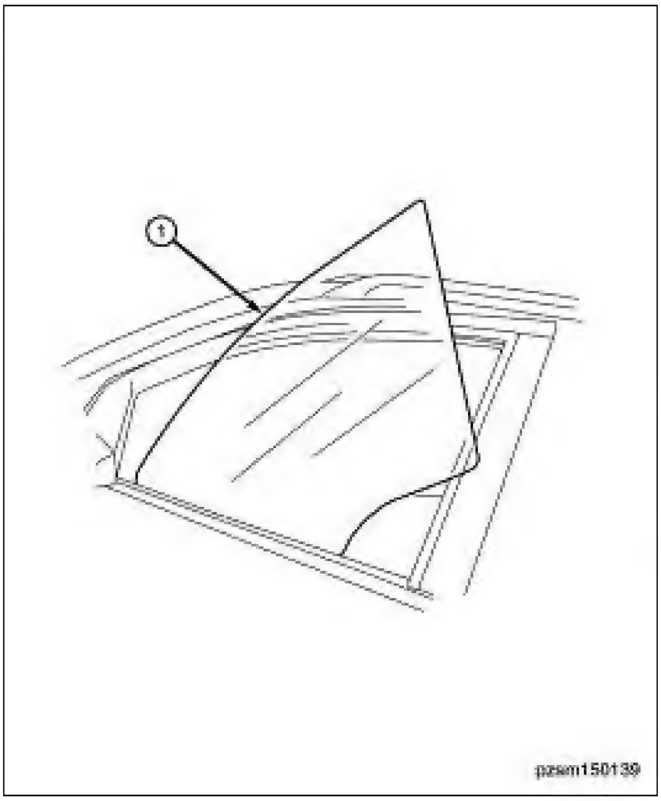
18. Remove the protective film (1) from the front door.


1
pzsm150133

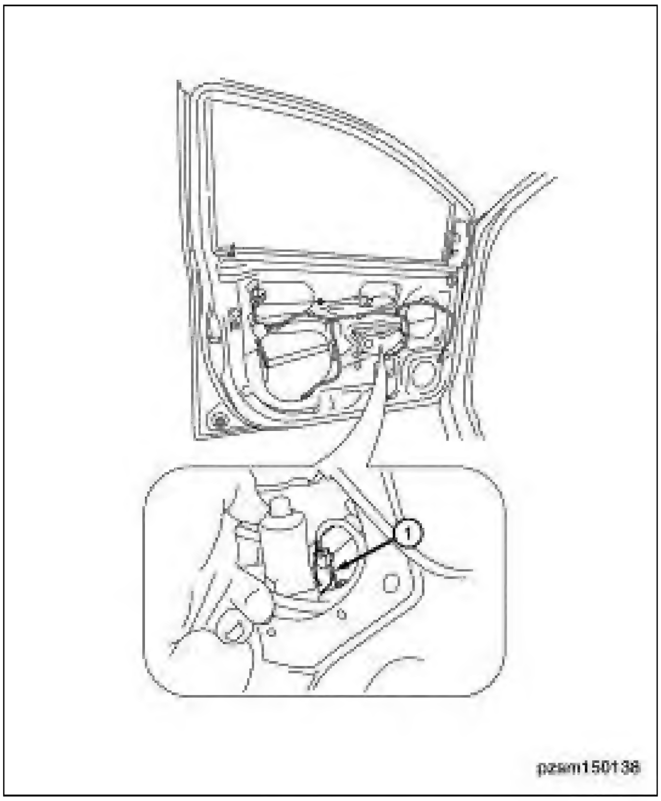
19. Lower the glass to a proper position, remove the two glass retaining screws (1).


1
pzsm150137

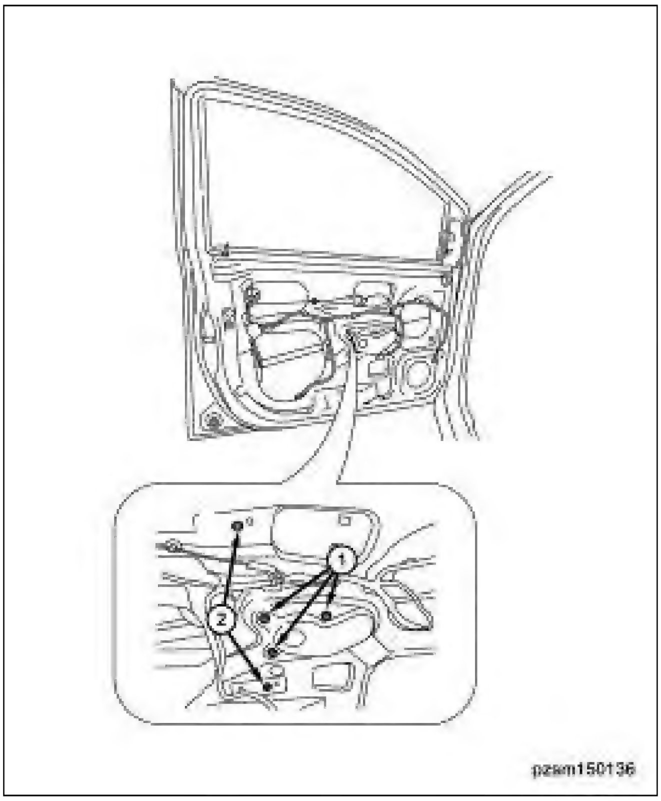
20. Remove the window glass (1).


1
pzsm150139

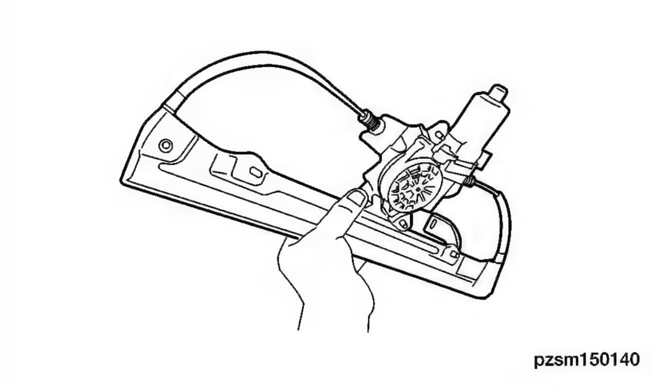
21. Disconnect the window motor electrical connector (1).


1
pzsm150138

22. Remove the two guide rail mounting nuts (2).
23. Remove the three window regulator retaining nuts (1).
    (Tighten: Window regulator retaining nuts to 9 ± 1 N·m)


1
2
pzsm150136

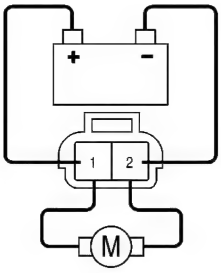
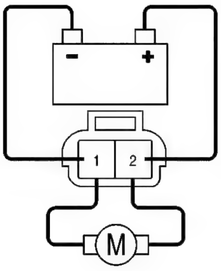
24. Remove the window regulator and guide rail assembly.


pzsm150140

25. Installation is in the reverse order of removal.

Power Window Motor Inspection

1. Using the following table, apply battery voltage to the specified connector terminals.
2. Verify that the motor operates smoothly when voltage is applied in each direction.
3. If the test results are not as specified, replace the motor.

MEASURING CONDITION	OPERATIONAL DIRECTION	INSPECTION DIAGRAM
Battery positive (+) to terminal – 1 Battery negative (-) to terminal – 2	Down	 vism150149
Battery positive (+) to terminal – 2 Battery negative (-) to terminal – 1	Up	 vism150150

SEATS

General Information

Description

The power seat switches are on the outboard side of the seat near the floor. The power seat system is capable of allowing a user to adjust the power seat to the desired driving position.

Operation

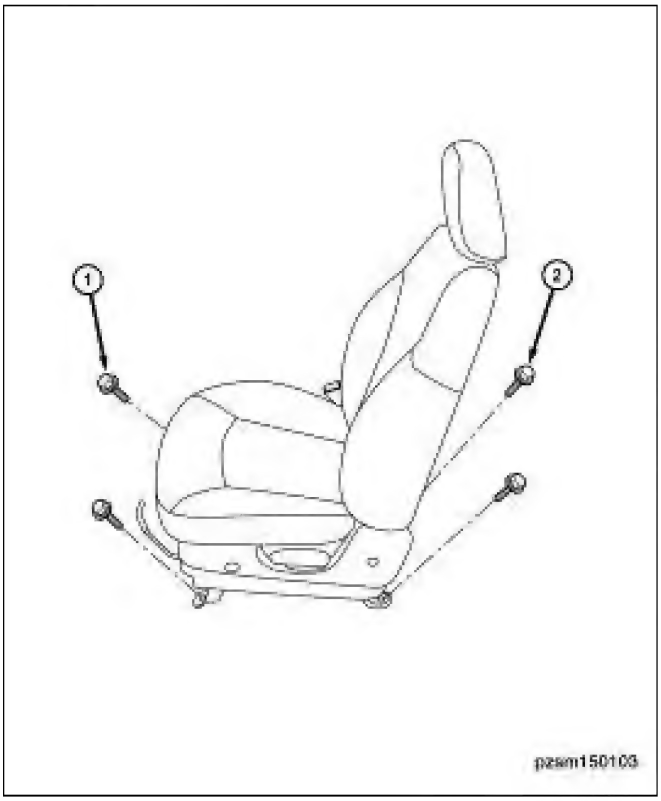
Use the switch to move the seat up, down, forward, rearward, or to tilt the seat. The power seat can be adjusted to control eight different seating positions.

Front Seat

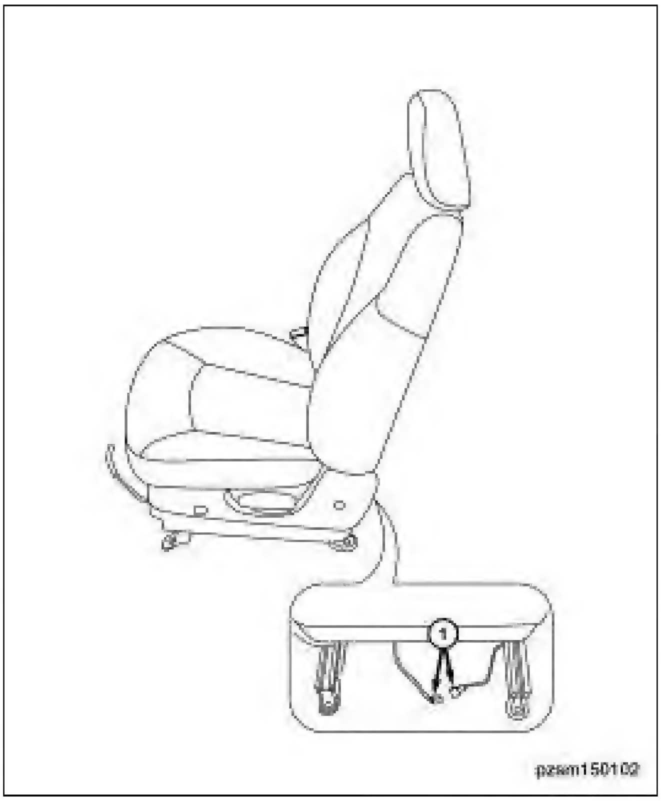
Removal & Installation

NOTE :
The removal & installation of the left seat is shown, the right seat is similar.

1. Move the seat to the furthest rearward position.
2. Remove the front seat mounting bolts (1) from the front of the seat guide rail.
3. Move the seat to the furthest frontward position and remove the protective cover from the guide rail.
4. Remove the front seat mounting bolts (2) from the back of the seat guide rail.



5. Disconnect the electrical connector (1) under the front seat.

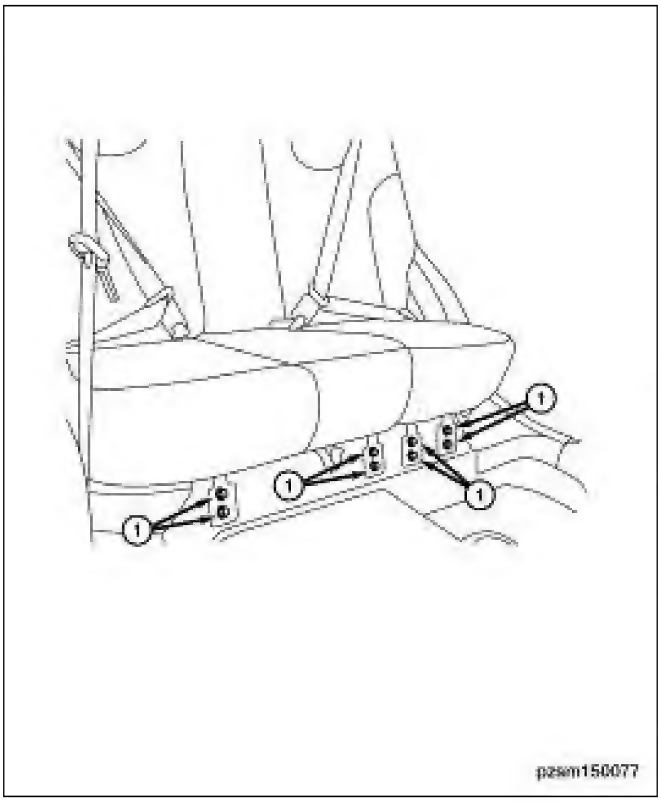


6. Installation is in the reverse order of removal.

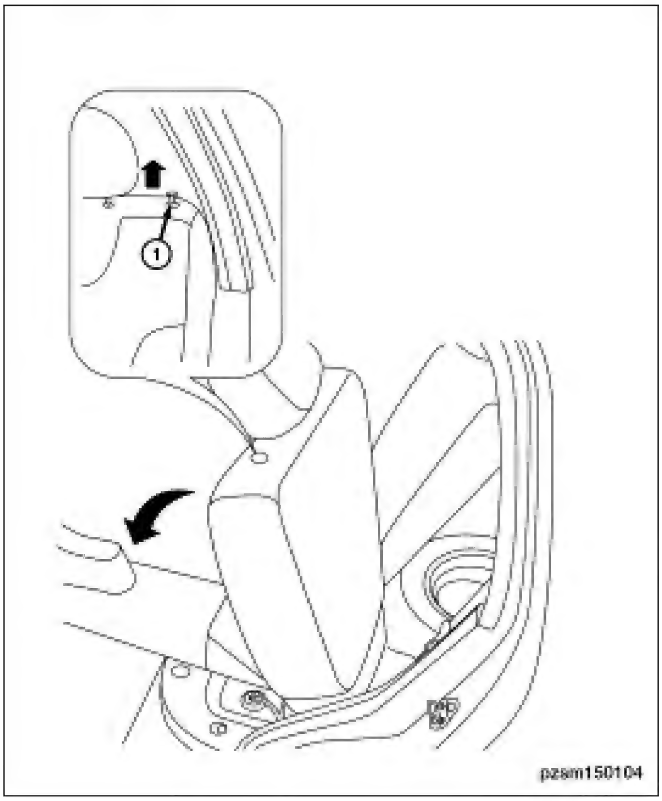
Rear Seat

Removal & Installation

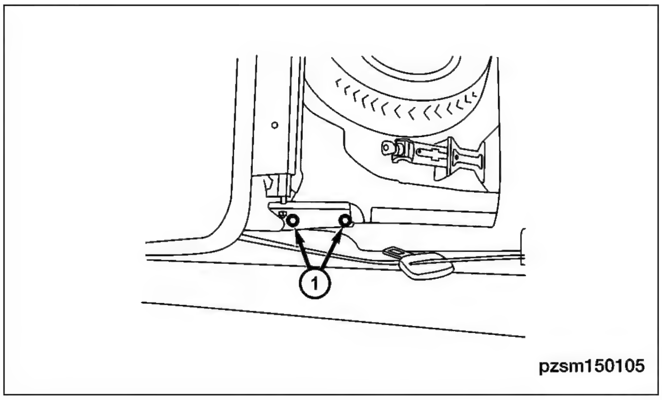
1. Remove the rear seat cushion retaining bolts (1). (Tighten: Rear seat cushion retaining bolts to 25 ± 3 N·m)



2. Remove the rear seat cushion.
3. Pull the seat release (1) upward to fold the rear seat.

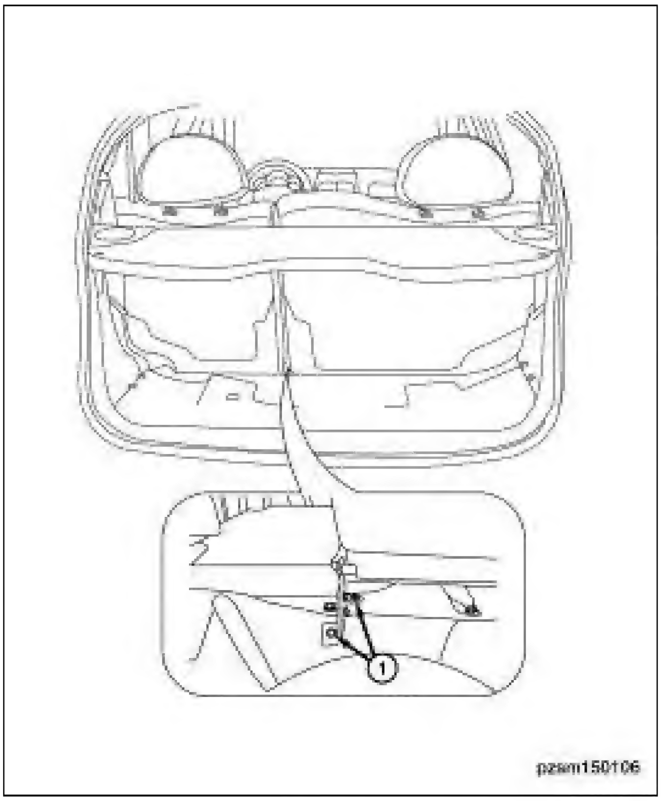


4. Remove the two left side rear seat mounting bolts (1).
   (Tighten: Left rear seat mounting bolts to 25 ± 3 N·m)



5. Remove the two right side rear seat mounting bolts.
   (Tighten: Right rear seat mounting bolts to 25 ± 3 N·m)
6. Open the rear hatch.
7. Remove the spare tire.

8. Remove the two middle bolts (1) from the rear seat.
   (Tighten: Rear seat middle mounting bolts to 25 ± 3 N·m)



9. Remove the rear seats.
10. Installation is in the reverse order of removal.

IMMOBILIZER CONTROL MODULE

Description

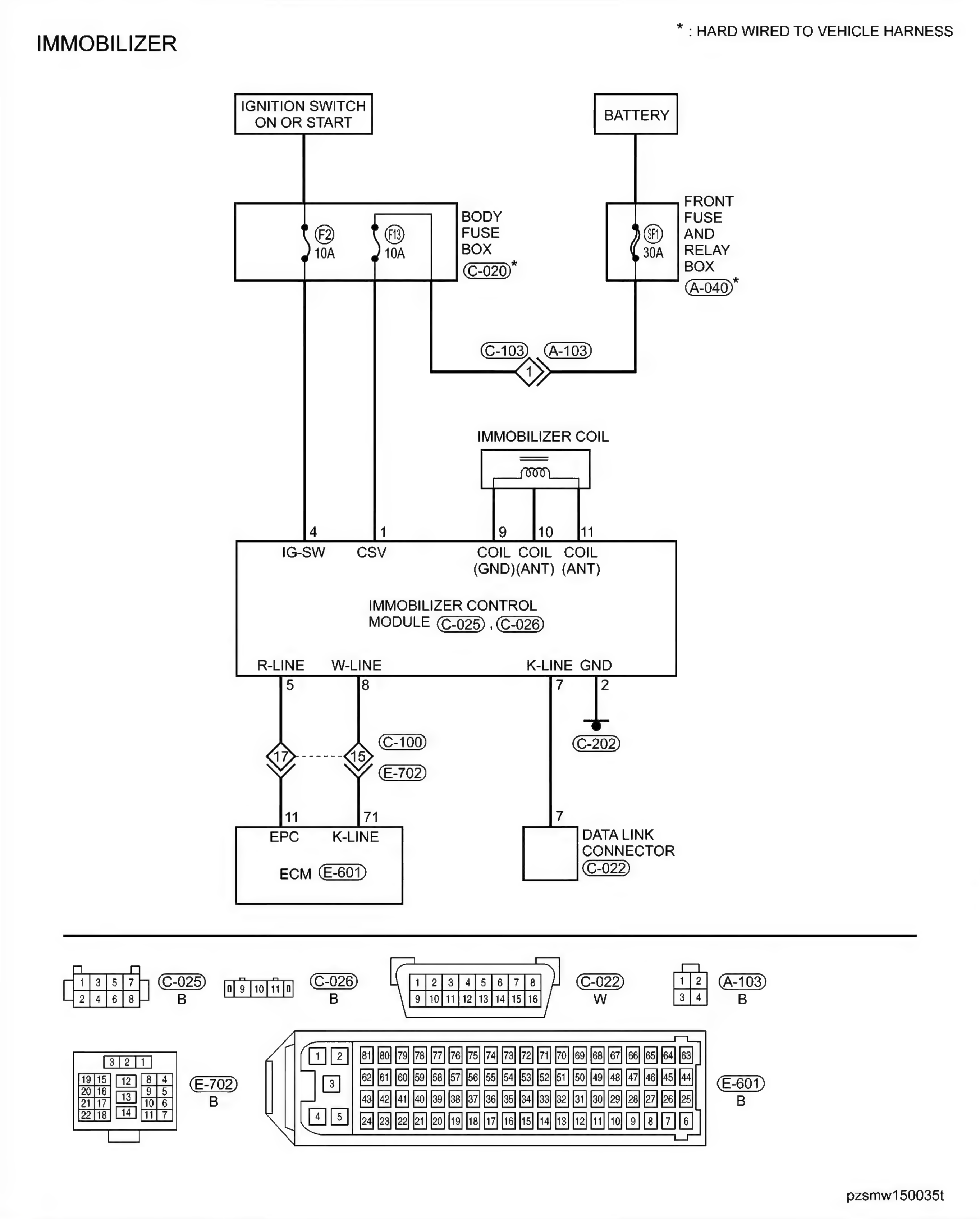
The vehicle security system uses a vehicle Immobilizer control module as an anti-theft device that prevents the engine from starting if an incorrect key is inserted into the ignition switch.

Operation

When an incorrect key is inserted into the ignition switch, the Immobilizer Coil senses the incorrect key and sends a signal to the Immobilizer control module. The Engine Control Module (ECM) receives the signal from Immobilizer control module via the R-line. The ECM then disables the engine from starting.

Electrical Schematics

Immobilizer Control Module (Page 1 of 1)


IMMOBILIZER
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BATTERY
F2 10A
F13 10A
BODY FUSE BOX
C-020*
SF1 30A
FRONT FUSE AND RELAY BOX
A-040*
C-103
A-103
1
IMMOBILIZER COIL
4
1
9
10
11
IG-SW
CSV
COIL (GND)
COIL (ANT)
COIL (ANT)
IMMOBILIZER CONTROL MODULE C-025 , C-026
R-LINE
W-LINE
K-LINE
GND
5
8
7
2
17
15
C-100
E-702
C-202
11
71
7
EPC
K-LINE
ECM E-601
DATA LINK CONNECTOR C-022
C-025 B
C-026 B
C-022 W
A-103 B
E-702 B
E-601 B
pzsmw150035t

Immobilizer Control Module Connector Pin-Out Table

PIN	CIRCUIT IDENTIFICATION	PIN	CIRCUIT IDENTIFICATION
1	Continuous Supply Voltage	7	Diagnostic Link K
2	GND	8	W-Line
3	—	9	Coil (GND)
4	Ignition Switch	10	Coil (ANT B)
5	R-Line	11	Coil (ANT A)
6	-	—	-

DIAGNOSIS & TESTING

Diagnostic Help

1. The X-431 scan tool connects to the Data Link Connector (DLC) and communicates with the vehicle electronic modules through the class two serial data circuit.
2. Confirm that the malfunction is current and carry-out the diagnostic tests and repair procedures.
3. If the DTC cannot be deleted, it is a current fault.
4. Use a digital multimeter to perform voltage readings on electronic systems.
5. Refer to any Technical Bulletins that issued.
6. Visually inspect the related electrical wiring harness.
7. Inspect and clean all Immobilizer control module grounds that are related to the DTC.
8. If numerous trouble codes were set, use the electrical schematic and look for any common ground circuits or voltage supply circuits that may apply to the DTC.

Intermittent DTC Troubleshooting

If the failure is intermittent, perform the following:

- Check for loose connectors.
- Look for any chafed, pierced, pinched, or partially broken wires.
- Monitor the scan tool data relative to this circuit.
- Wiggle the related electrical wiring harness and connectors while looking for an interrupted signal on the affected circuit.
- If possible, try to duplicate the conditions under which the DTC set.
- Look for the data to change or for the DTC to reset during the wiggle test.
- Look for broken, bent, pushed out or corroded terminals.
- Inspect the sensor and mounting area for any condition that would result in an incorrect signal, such as damage or foreign material.
- A data recorder, and/or oscilloscope should be used to help diagnose intermittent conditions.

Ground Inspection

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This added resistance can alter the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can effect the circuit. Perform the following when inspecting a ground connection:

1. Remove the ground bolt or screw.
2. Inspect all mating surface for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for ″add-on″ accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are crimped to one eyelet, make sure no excess wire insulation has been crimped creating a bad ground.

Diagnostic Tools

- Diagnostic Scan Tool X-431
- Digital Multimeter
- Jumper Wire

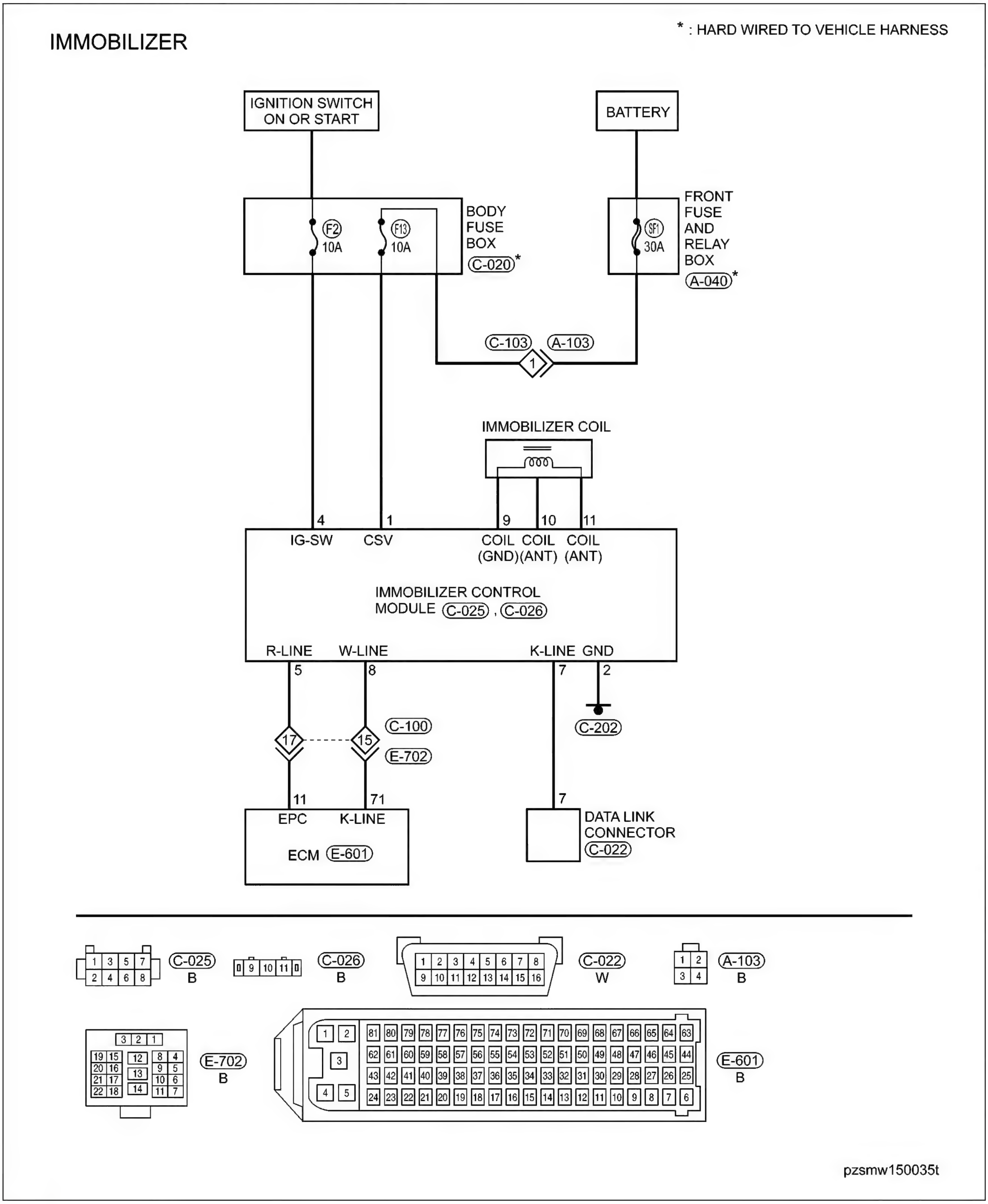
Diagnostic Trouble Code (DTC) List

Immobilizer Control Module DTC List

DTC	DTC DEFINITION
B1000	ECU Defect, Internal Errors
B3040	Communication Error On W-Line, ECM Doesn't Answer On Challenge Or Response Requests
B3042	W-Line Short Circuit To Ground
B3043	W-Line Short Circuit To Battery
B3045	DWA Line Short Circuit To Ground Or Open Circuit, DWA Line Malfunction
B3048	DWA Line Short Circuit To Battery
B3050	Relay External Line Short Circuit To Ground Or Open Circuit, Relay External Line Malfunction
B3053	Relay External Line Short Circuit To Battery
B3055	No Transponder Modulation Or No Transponder
B3056	No Transponder Fix Code Programmed
B3057	No Security Code Programmed
B3060	Unprogrammed Transponder Fix Code Received
B3061	Disturbed Or No Challenge / Response Transponder Communication
B3077	Read-Only Transponder Detected

Diagnostic Trouble Code (DTC) Tests

B1000 - ECU Defect, Internal Errors


IMMOBILIZER
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BATTERY
F2 10A
F13 10A
BODY FUSE BOX C-020*
SF1 30A
FRONT FUSE AND RELAY BOX A-040*
C-103
A-103
1
IMMOBILIZER COIL
4
1
9
10
11
IG-SW
CSV
COIL (GND)
COIL (ANT)
COIL (ANT)
IMMOBILIZER CONTROL MODULE C-025, C-026
R-LINE
W-LINE
K-LINE
GND
5
8
7
2
17
15
C-100
E-702
C-202
11
71
7
EPC
K-LINE
ECM E-601
DATA LINK CONNECTOR C-022
C-025 B
C-026 B
C-022 W
A-103 B
E-702 B
E-601 B
pzsmw150035t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	POSSIBLE CAUSE
B1000	ECU defect, internal Errors	Immobilizer control module detects an internal failure.	Immobilizer control module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in the Immobilizer control module.
- Try to start the engine.
- Turn ignition switch off, and wait a few seconds, then turn ignition switch on.
- With the scan tool, view DTCs in the Immobilizer.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK DTC

- Perform DTC confirmation procedure.

Is DTC B1000 present?

Yes >> Go to the next step.

No >> The conditions that caused this code to set are not present at this time (See Diagnostic Help in Section 15 Body & Accessories).

2. CHECK GROUND CONNECTION

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 15 Body & Accessories).
- Inspect ground connection C-202 mounting position (See Vehicle Wiring Harness Layout - Main Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace ground connection.

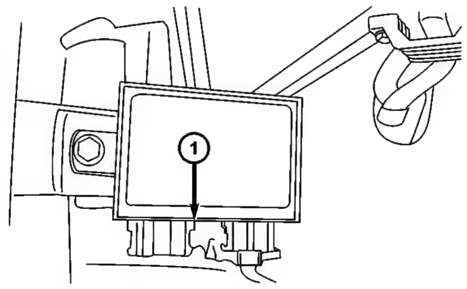
3. CHECK IMMOBILIZER CONTROL MODULE ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Immobilizer control module electrical connector C-025 (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

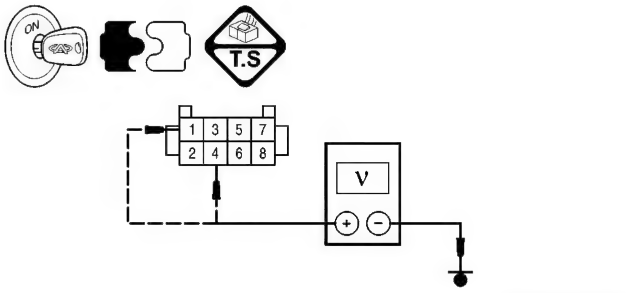
No >> Repair or replace the electrical connector as necessary.



ltsmd150019

4. CHECK IMMOBILIZER CONTROL MODULE POWER SUPPLY

- Connect the negative battery cable.
- Turn ignition switch on.
- Check voltage between the Immobilizer control module connector C-025, terminal 4, 1 and ground.

IMMOBILIZER CONTROL MODULE TERMINAL	GROUND	VOLTAGE	 ltsmd150012
1	Ground	12 V should exist	
4			

Is the check result normal?

Yes >> Go to step 7.

No >> Go to the next step.

5. CHECK IMMOBILIZER CONTROL MODULE POWER SUPPLY CIRCUIT

- Turn ignition switch off.
- Disconnect the negative battery cable.
- Check the continuity between the front fuse and relay box A-040, fuse SF1 (30A) and Immobilizer control module connector C-025, terminal 1.
    - Inspect front fuse and relay box A-040, fuse SF1 (30A) position (See Vehicle Wiring Harness Layout - Engine Room Harness in Section 16 Wiring).
- Check harness continuity between body fuse box C-020, fuse F2 (10A) and Immobilizer control module connector C-025, terminal 4.
    - Inspect body fuse box C-020, fuse F2 (10A) position (See Vehicle Wiring Harness Layout - Main Harness in Section 16 Wiring).
- Continuity should exist.
- Check harness for short to ground.
- Continuity between Immobilizer control module power supply and ground should not exist.

Is the check result normal?

Yes >> Go to the step 7.

No >> Check fuse F2 (10A), fuse 13 (10A) and fuse SF1 (30A). Verify the fuse is OK, If not OK, refer to the wiring diagram to identify the possible causes of the shorted circuit.
Repair or replace the open or high resistance circuit or short to ground in harness or connectors.

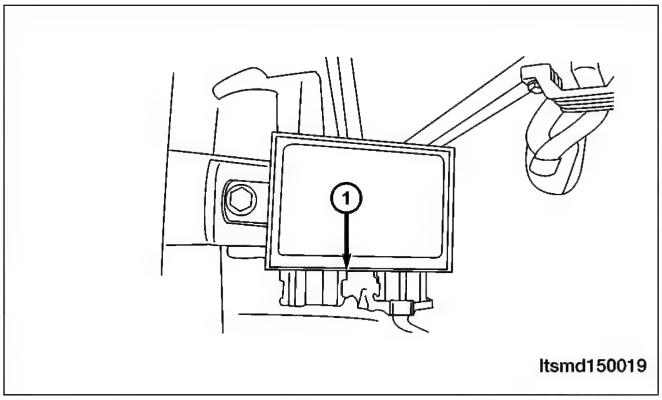
6. CHECK IMMOBILIZER CONTROL MODULE ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Immobilizer control module electrical connector C-026 (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

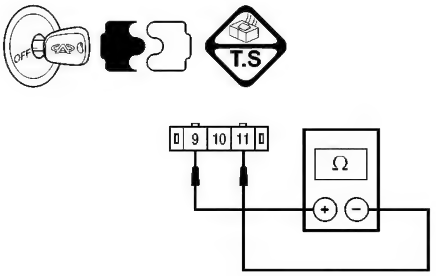
Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

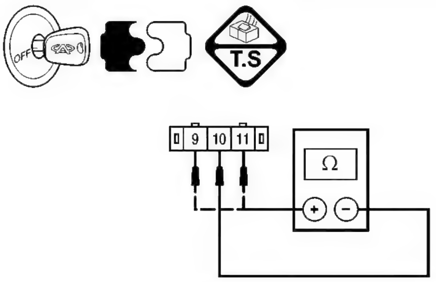


7. CHECK IMMOBILIZER COIL

- Check the resistance between the Immobilizer coil connector C-026, terminal 9 and terminal 11.
- The resistance should be 5 to 20 ohms.

IMMOBILIZER COIL TERMINAL	IMMOBILIZER COIL TERMINAL	RESISTANCE	
9	11	5 - 20 ohms	

- Check the resistance between the Immobilizer coil connector C-026, terminal 9 and terminal 10.
- Check the resistance between the Immobilizer coil connector C-026, terminal 11 and terminal 10.
- There should NOT be any continuity.

IMMOBILIZER COIL TERMINAL	IMMOBILIZER COIL TERMINAL	CONTINUITY	
9	10	No	
11	10		

Is the check result normal?

Yes >> Go to the next step.

No >> Replace the Immobilizer coil.

8. CHECK DTC

- With the X-431 scan tool, read the Immobilizer control module DTCs.
- Refer to ″DTC Confirmation Procedure″.

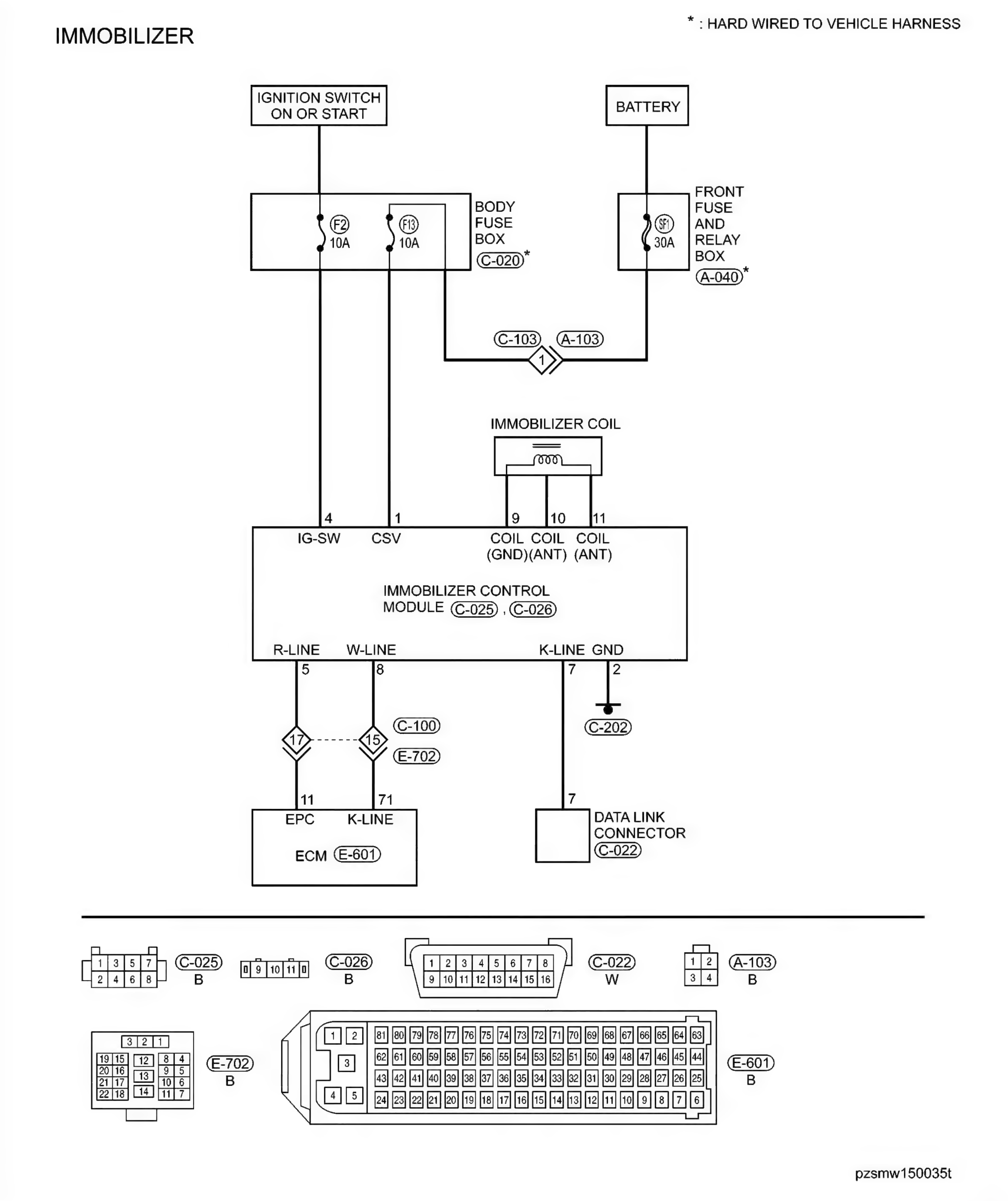
Is DTC B1000 still present?

Yes >> Replace the Immobilizer control module and match the ECM to the new Immobilizer control module (See Immobilizer Control Module Removal & Installation in Section 15 Body & Accessories).
Refer to DTC B3077 Diagnostic Procedure.

No >> The system is now operating properly.
Reassemble the vehicle and verify the customers complaint is repaired.

B3042 - W-Line Short Circuit To Ground
B3043 - W-Line Short Circuit To Battery

Immobilizer Control Module


IMMOBILIZER
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BATTERY
F2 10A
F13 10A
BODY FUSE BOX C-020*
SF1 30A
FRONT FUSE AND RELAY BOX A-040*
C-103
A-103
1
IMMOBILIZER COIL
4
1
9
10
11
IG-SW
CSV
COIL (GND)
COIL (ANT)
COIL (ANT)
IMMOBILIZER CONTROL MODULE C-025, C-026
R-LINE
W-LINE
K-LINE
GND
5
8
7
2
C-202
17
15
C-100
E-702
11
71
7
EPC
K-LINE
ECM E-601
DATA LINK CONNECTOR C-022
C-025 B
C-026 B
C-022 W
A-103 B
E-702 B
E-601 B
pzsmw150035t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B3042	W-line short circuit to ground	Ignition switch: ON	The Immobilizer control module detects a short ground condition on the W-Line for at least 3 seconds.	• Harness or connectors • Immobilizer control module • ECM
B3043	W-Line short circuit to battery		The Immobilizer control module detects a short battery condition on the W-Line for at least 3 seconds.	• Harness or connectors • Immobilizer control module • ECM

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in Immobilizer control module.
- Try to start the engine.
- Turn ignition switch off, and wait a few seconds, then turn the ignition switch on.
- With the scan tool, view active DTCs in the Immobilizer control module.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 15 Body & Accessories).
- Inspect ground connection C-202 mounting position (See Vehicle Wiring Harness Layout - Main Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. CHECK IMMOBILIZER CONTROL MODULE DTC

- With the scan tool, view DTCs in the Immobilizer control module.
- Refer to DTC confirmation procedure.

Is the warning light flashing and DTC B3042 or B3043 present?

Yes >> Go to the next step.

No >> The conditions that caused this code to set are not present at this time (See Diagnostic Help in Section 15 Body & Accessories).

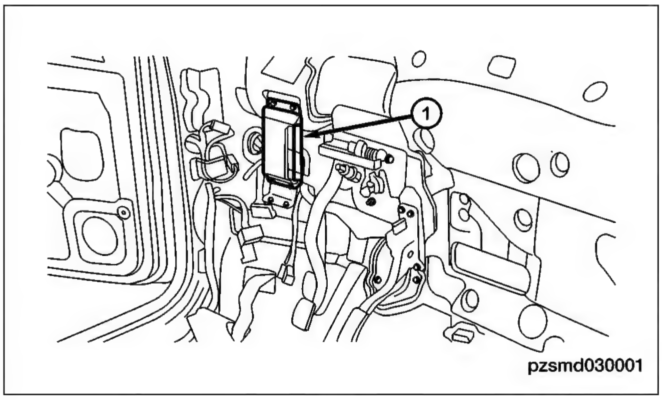
3. CHECK ENGINE CONTROL MODULE (ECM) ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Engine Control Module (ECM) electrical connector E-601 (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



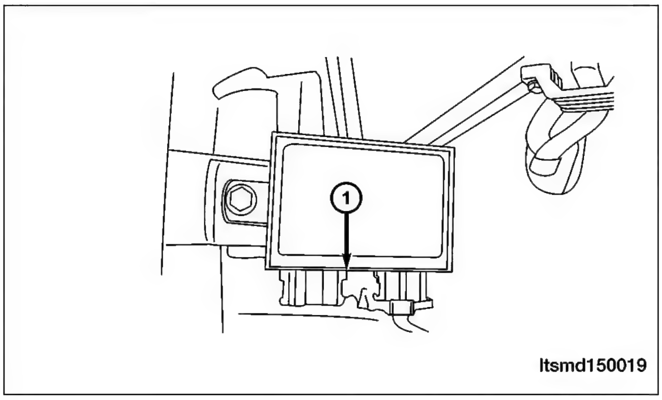
4. CHECK IMMOBILIZER CONTROL MODULE ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Immobilizer control module electrical connector C-025, C-026 (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

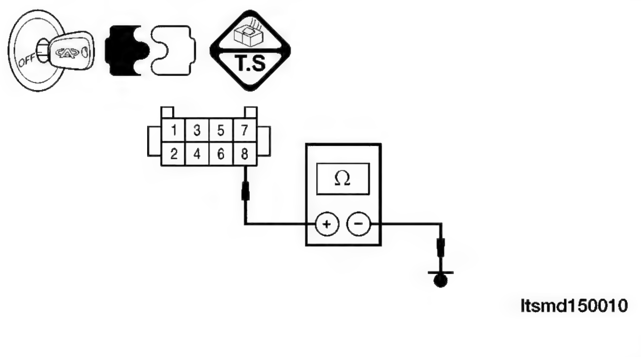
Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.

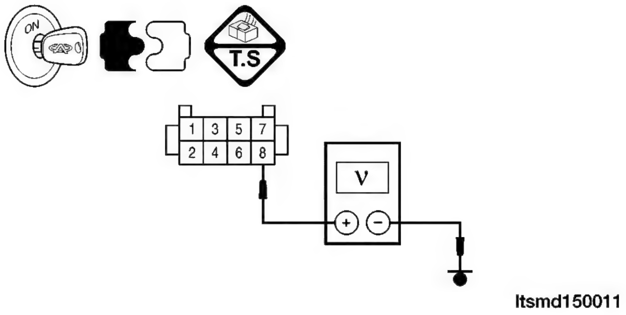


5. CHECK IMMOBILIZER CONTROL MODULE AND ECM COMMUNICATION CIRCUIT

- For DTC B3042, check the resistance of W-Line between the Immobilizer control module connector C-025, terminal 8 and ground.

IMMOBILIZER CONTROL MODULE TERMINAL	TERMINAL	RESULT	 OFF T.S 1 3 5 7 2 4 6 8 Ω + − ltsmd150010
8	Ground	Continuity should not exist	

- For DTC B3043, turn ignition switch on, check voltage between the Immobilizer control module connector C-025, terminal 8 and ground.

IMMOBILIZER CONTROL MODULE TERMINAL	TERMINAL	RESULT	
8	Ground	12 V should not exist	

Is the check result normal?

Yes >> Go to the next step.

No >> Repair the circuits fault as necessary.

6. REPLACE AND MATCH THE IMMOBILIZER CONTROL MODULE

- Replace and program the Immobilizer control module with the X-431.
- Reconnect all previously disconnected components.
- With the X-431 scan tool, view the DTCs in the Immobilizer control module.

Is DTC B3042 or B3043 present again?

Yes >> Go to the next step.

No >> The system is now operating properly.
The DTC was caused by the Immobilizer control module.

7. REPLACE AND MATCH THE ECM

- With the X-431 scan tool, view active DTCs in ECM.
- Refer to ″DTC Confirmation Procedure″.

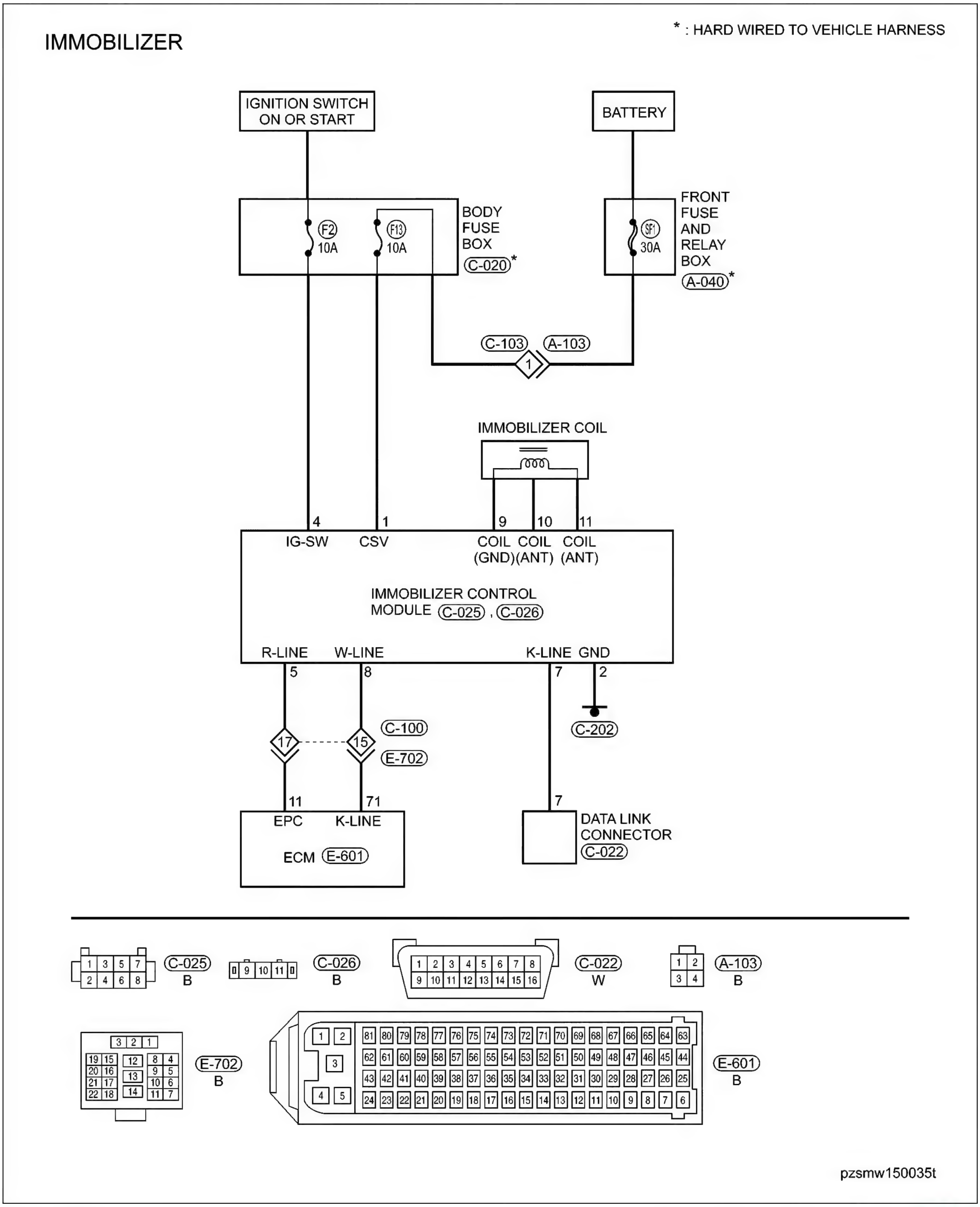
Is DTC B3042 or B3043 still present?

Yes >> Replace the ECM and match the Immobilizer control module to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

B3050 - Relay External Line Short Circuit To Ground Or Open Circuit, Relay External Line Malfunction

B3053 - Relay External Line Short Circuit To Battery


IMMOBILIZER
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BATTERY
F2 10A
F13 10A
BODY FUSE BOX C-020*
SF1 30A
FRONT FUSE AND RELAY BOX A-040*
C-103
A-103
1
IMMOBILIZER COIL
4
1
9
10
11
IG-SW
CSV
COIL (GND)
COIL (ANT)
COIL (ANT)
IMMOBILIZER CONTROL MODULE C-025, C-026
R-LINE
W-LINE
K-LINE
GND
5
8
7
2
C-100
E-702
17
15
C-202
11
71
7
EPC
K-LINE
ECM E-601
DATA LINK CONNECTOR C-022
C-025 B
C-026 B
C-022 W
A-103 B
E-702 B
E-601 B
pzsmw150035t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B3050	Relay external line short circuit to ground or open circuit, relay external line malfunction	Ignition switch: ON	The Immobilizer control module detects a short ground condition on the relay external line for at least 3 seconds.	• Harness or connectors • Immobilizer control module
B3053	Relay external line short circuit to battery	Ignition switch: ON	The Immobilizer control module detects a short to battery condition on the relay external line.	• Harness or connectors • Immobilizer control module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn ignition switch on, with the scan tool, view and erase stored DTCs in Immobilizer control module.
- Try to start the engine.
- Turn ignition switch off, and wait a few seconds, then turn ignition switch on.
- With the scan tool, view active DTCs in the Immobilizer control module.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 15 Body & Accessories).
- Inspect ground connection C-202 mounting position (See Vehicle Wiring Harness Layout - Main Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace ground connection.

2. CHECK IMMOBILIZER CONTROL MODULE DTC

- With the scan tool, view DTCs in the Immobilizer control module.
- Refer to DTC confirmation procedure.

Is DTC B3050 or B3053 present?

Yes >> Go to the next step.

No >> The conditions that caused this code to set are not present at this time (See Diagnostic Help in Section 15 Body & Accessories).

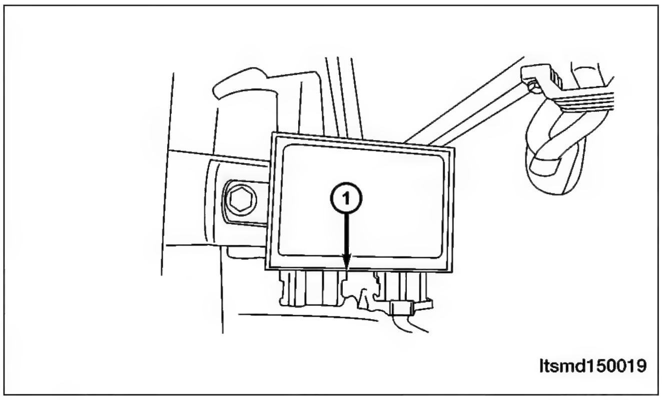
3. CHECK IMMOBILIZER CONTROL MODULE ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Immobilizer control module electrical connector C-025 (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

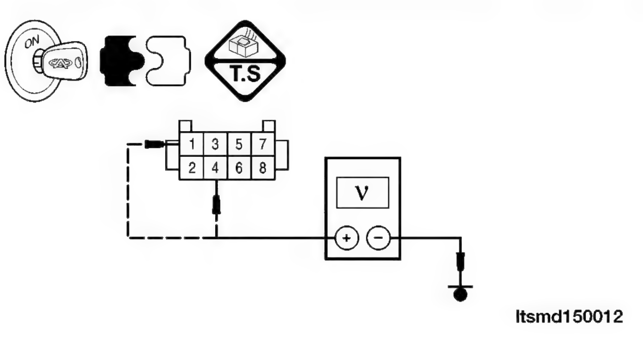
Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



4. CHECK IMMOBILIZER CONTROL MODULE POWER SUPPLY

- Turn ignition switch on.
- Check voltage between the Immobilizer control module connector C-025, terminal 4, 1 and ground.

IMMOBILIZER CONTROL MODULE TERMINAL	GROUND	VOLTAGE	
1	Ground	12 V should exist	
4			

Is the check result normal?

Yes >> Replace the Immobilizer control module and match the ECM to the Immobilizer control module (See Immobilizer Control Module Removal & Installation in Section 15 Body & Accessories).

No >> For DTC B3050, go to the next step.
For DTC B3053, go to the step 6.

5. CHECK IMMOBILIZER CONTROL MODULE POWER SUPPLY CIRCUIT

- Turn ignition switch off.
- Disconnect the negative battery cable.
- Check the continuity between the front fuse and relay box A-040, fuse SF1 (30A) and Immobilizer control module connector C-025, terminal 1.
    - Inspect front fuse and relay box A-040, fuse SF1 (30A) position (See Vehicle Wiring Harness Layout - Engine Room Harness in Section 16 Wiring).
- Check harness continuity between body fuse box C-020, fuse F2 (10A) and Immobilizer control module connector C-025, terminal 4.
    - Inspect body fuse box C-020, fuse F2 (10A) position (See Vehicle Wiring Harness Layout - Main Harness in Section 16 Wiring).
- Continuity should exist.
- Check harness for short to ground.
- Continuity between Immobilizer control module power supply and ground should not exist.

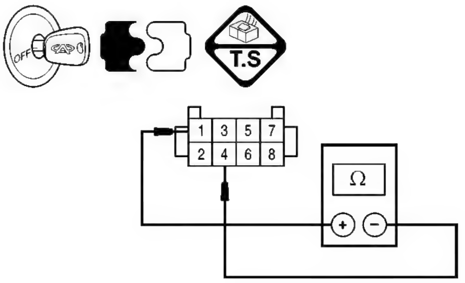
Is the check result normal?

Yes >> Go to the step 7.

No >> Check fuse F2 (10A), fuse 13 (10A) and fuse SF1 (30A). Verify the fuse is OK, If not OK, refer to the wiring diagram to identify the possible causes of the shorted circuit.
Repair or replace the open or high resistance circuit or short to ground in harness or connectors.

6. CHECK IMMOBILIZER CONTROL MODULE POWER SUPPLY CIRCUIT

- Turn ignition switch off.
- Disconnect the negative battery cable.
- Check the resistance between the Immobilizer control module ignition switch circuit terminal 4 and Immobilizer control module power supply circuit terminal 1.

IMMOBILIZER CONTROL MODULE TERMINAL	IMMOBILIZER CONTROL MODULE TERMINAL	CONTINUITY	 ltsmd150018
1	4	No	

- Check resistance between Immobilizer control module ignition switch circuit and other power circuits.

Is the check result normal?

Yes >> Go to the step 8.

No >> Repair or replace short to power circuits in harness or connectors.

7. DETECT MALFUNCTIONING PART

- Check fuse F2 (10A), fuse 13 (10A) and fuse SF1 (30A).
- Check body fuse box C-020, front fuse and relay box A-040.
- Check harness connector A-103, C-103, terminal 1.
- Check harness between battery and body fuse box, harness between battery and front fuse and relay box.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace damaged components.

8. REPLACE AND MATCH THE IMMOBILIZER CONTROL MODULE

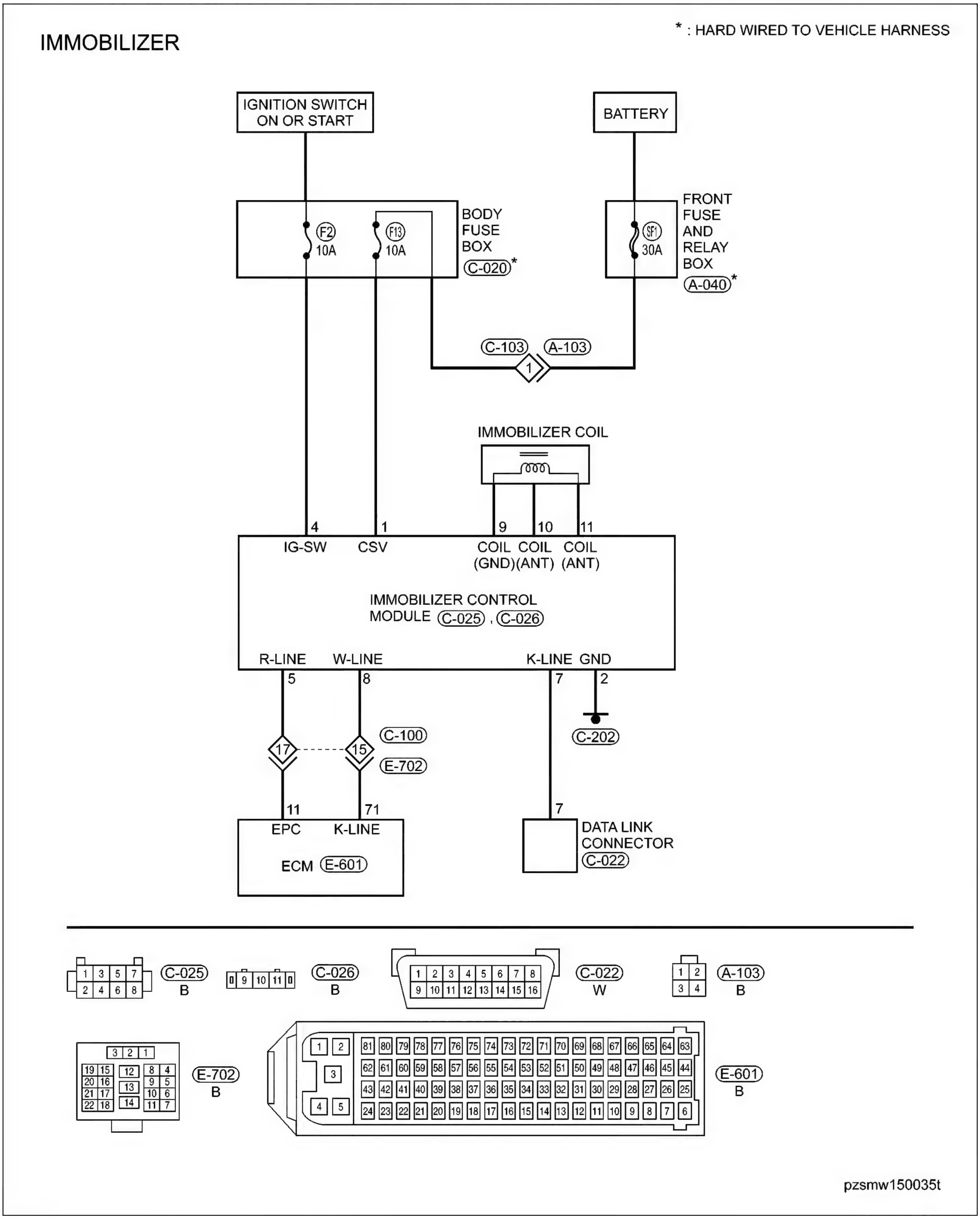
- With the X-431 scan tool, view active DTCs in the Immobilizer control module.
- Refer to ″DTC Confirmation Procedure″.

Is DTC B3050 or B3053 still present?

Yes >> Replace the Immobilizer control module and match the ECM to the new Immobilizer control module (See Immobilizer Control Module Removal & Installation in Section 15 Body & Accessories).

No >> The system is now operating properly.
Reassemble the vehicle and road test to verify the customers complaint is repaired.

B3055 - No Transponder Modulation Or No Transponder
B3056 - No Transponder Fixed Code Programmed


IMMOBILIZER
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BATTERY
F2 10A
F13 10A
BODY FUSE BOX C-020*
SF1 30A
FRONT FUSE AND RELAY BOX A-040*
C-103
A-103
1
IMMOBILIZER COIL
4
1
9
10
11
IG-SW
CSV
COIL (GND)
COIL (ANT)
COIL (ANT)
IMMOBILIZER CONTROL MODULE C-025, C-026
R-LINE
W-LINE
K-LINE
GND
5
8
7
2
C-202
17
15
C-100
E-702
11
71
7
EPC
K-LINE
ECM E-601
DATA LINK CONNECTOR C-022
C-025 B
C-026 B
C-022 W
A-103 B
E-702 B
E-601 B
pzsmw150035t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B3055	No transponder modulation or no transponder	Ignition switch: ON	The Immobilizer control module detects no transponder or no transponder modulation condition.	• Transponder • Harness or connectors • Immobilizer control module
B3056	No transponder fixed code programmed		The Immobilizer control module detects that the transponder is not programmed.	• Transponder • Harness or connectors • Immobilizer control module

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn the ignition switch on, with the scan tool, view and erase stored DTCs in Immobilizer control module.
- Try to start the engine.
- Turn ignition switch off, and wait a few seconds, then turn the ignition switch on.
- With the scan tool, view active DTCs in the Immobilizer control module.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 15 Body & Accessories).
- Inspect ground connection C-202 mounting position (See Vehicle Wiring Harness Layout - Main Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. CHECK IMMOBILIZER CONTROL MODULE DTC

- With the scan tool, view DTCs in the Immobilizer control module.
- Refer to DTC confirmation procedure.

Is DTC B3055 present?

Yes >> Go to the next step.

No >> The conditions that caused this code to set are not present at this time (See Diagnostic Help in Section 15 Body & Accessories).

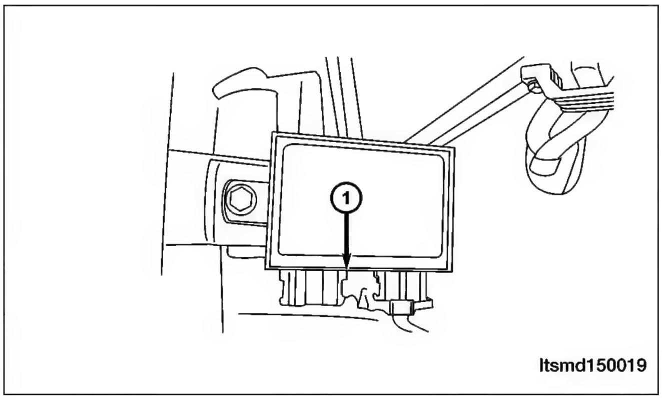
3. CHECK IMMOBILIZER CONTROL MODULE ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Immobilizer control module electrical connector C-026 (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

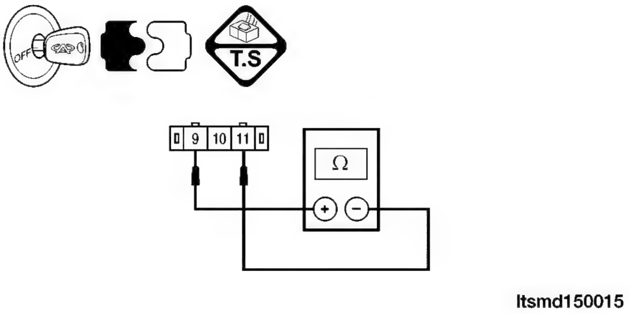
Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



4. CHECK IMMOBILIZER COIL

- Check the resistance between the Immobilizer coil connector C-026, terminal 9 and terminal 11.

IMMOBILIZER COIL TERMINAL	IMMOBILIZER COIL TERMINAL	
9	11	

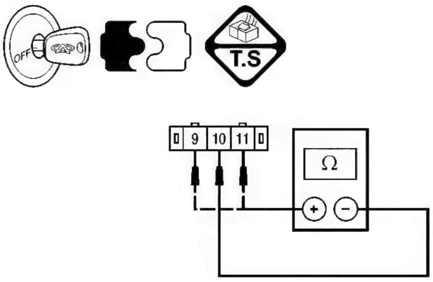
Does the resistance range from 5 to 20 ohms?

Yes >> Go to the next step.

No >> Replace the Immobilizer coil.

5. CHECK IMMOBILIZER COIL

- Check the resistance between the Immobilizer coil connector C-026, terminal 9 and terminal 10.
- Check the resistance between the Immobilizer coil connector C-026, terminal 11 and terminal 10.

IMMOBILIZER COIL TERMINAL	IMMOBILIZER COIL TERMINAL	CONTINUITY	 ltsmd150016
9	10	No	
11	10		

- Continuity should not exist.

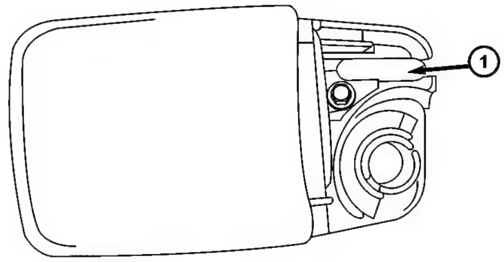
Is the check result normal?

Yes >> Go to the next step.

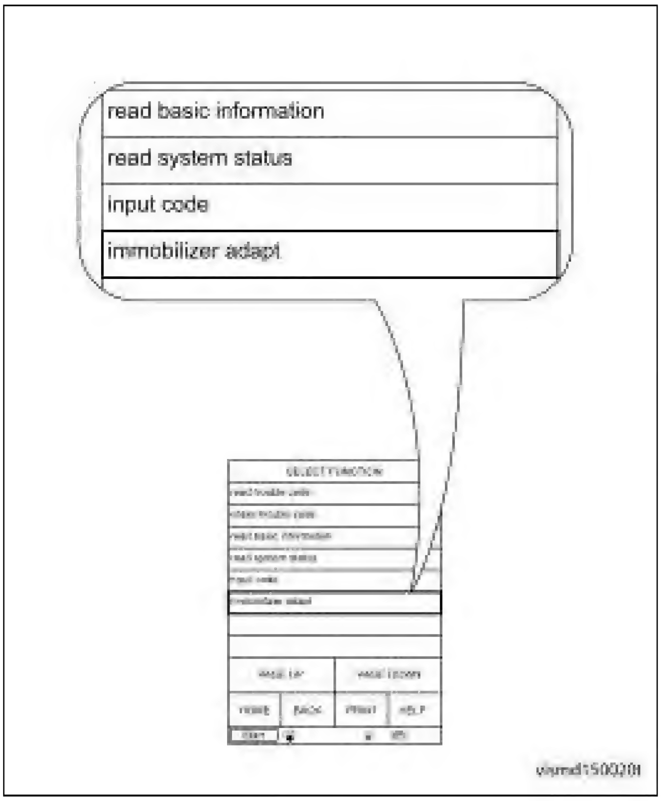
No >> Replace the Immobilizer coil.

6. REPLACE AND MATCH TRANSPONDER

- Reconnect the Immobilizer control module electrical connector C-026.
- Replace the chip (1) with a new one.



vismd150018



- Turn ignition switch on and perform the following:
  - With the X-431 scan tool, choose A1 series.
  - Choose ″immobilize″.
  - Choose ″input code″.
  - Input the safety code.
  - Click the small keyboard.
  - Click ″OK″.
  - Choose ″Immobilizer adapt″.
  - Choose ″Key learning″ immediately.
  - Click ″OK″.
- Try to start the engine.

Is the warning light flashing and DTC B3055 present?

Yes >> Go to the next step.

No >> No problem found at this time.
This concern may have been caused by the transponder.
Erase all codes before returning the vehicle to the customer.

7. REPLACE AND MATCH IMMOBILIZER CONTROL MODULE

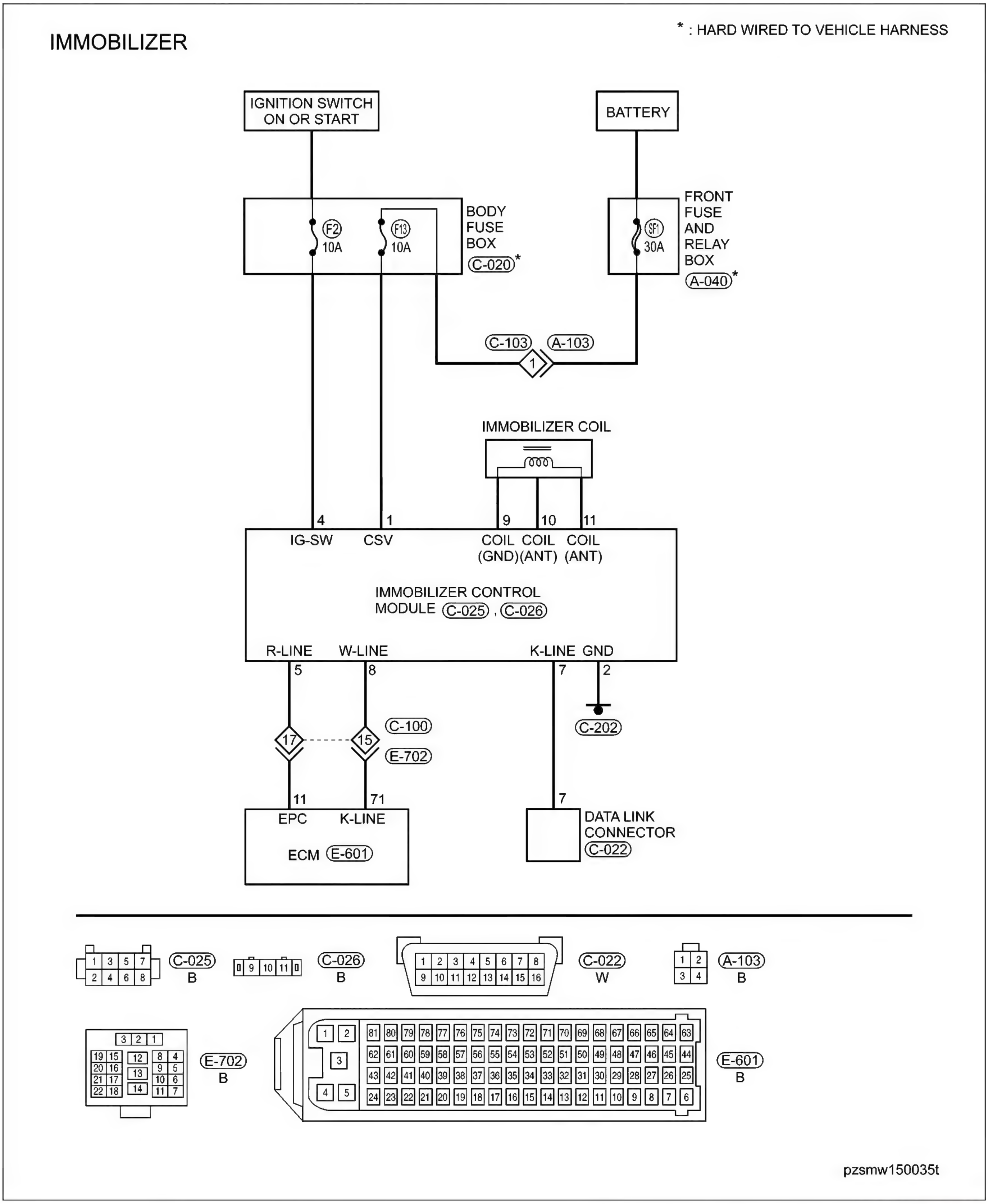
- Using the electrical schematic as a guide, inspect the related wiring and connectors of the Immobilizer control module.
- Verify that there is good terminal contact in the related connectors.
- Try to start the engine.
- With the X-431 scan tool, view active DTCs in Immobilizer control module.

Is the warning light flashing and DTC B3055 or B3056 still present?

Yes >> Replace the Immobilizer control module and match the ECM to the new Immobilizer control module (See Immobilizer Control Module Removal & Installation in Section 15 Body & Accessories).

No >> No problem found at this time.
This concern may have been caused by a loose or corroded terminal or connector.
Erase all codes before returning the vehicle to the customer.

B3060 - Unprogrammed Transponder Fixed Code Received
B3061 - Disturbed Or No Challenge/Response Transponder Communication
B3077 - Read-Only Transponder Detected


IMMOBILIZER
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BATTERY
F2 10A
F13 10A
BODY FUSE BOX C-020*
SF1 30A
FRONT FUSE AND RELAY BOX A-040*
C-103
A-103
1
IMMOBILIZER COIL
4 IG-SW
1 CSV
9 COIL (GND)
10 COIL (ANT)
11 COIL (ANT)
IMMOBILIZER CONTROL MODULE C-025 , C-026
R-LINE 5
W-LINE 8
K-LINE 7
GND 2
17
15
C-100
E-702
C-202
11 EPC
71 K-LINE
ECM E-601
7
DATA LINK CONNECTOR C-022
C-025 B
C-026 B
C-022 W
A-103 B
E-702 B
E-601 B
pzsmw150035t

On Board Diagnostic Logic

- Self-diagnosis detection logic.

DTC NO.	DTC DEFINITION	DTC DETECTION CONDITION	DTC SET CONDITION	POSSIBLE CAUSE
B3060	Unprogrammed transponder fixed code received	Ignition switch: ON	The Immobilizer control module detects the received unprogrammed transponder condition.	• Transponder • Harness or connectors • Immobilizer control module • ECM
B3061	Disturbed or no challenge/response transponder communication		The Immobilizer control module detects the received unprogrammed transponder condition.	
B3077	Read-only transponder detected		The Immobilizer control module detects a read-only transponder condition.	

DTC Confirmation Procedure:

Before performing the following procedure, confirm that battery voltage is more than 12 V.

- Turn ignition switch off.
- Connect the X-431 scan tool to the Data Link Connector (DLC) - use the most current software available.
- Turn the ignition switch on, with the scan tool, view and erase stored DTCs in Immobilizer control module.
- Try to start the engine.
- Turn the ignition switch off, and wait a few seconds, then turn the ignition switch on.
- With the scan tool, view active DTCs in the Immobilizer control module.
- If the DTC is detected, the condition is current. Go to Diagnostic Procedure - Step 1.
- If the DTC is not detected, the DTC condition is intermittent (See Diagnostic Help and Intermittent DTC Troubleshooting in Section 15 Body & Accessories for more information).

NOTE :
While performing electrical diagnosis & testing, always refer to the electrical schematics for specific circuit and component information.

Diagnostic Procedure

1. CHECK GROUND CONNECTIONS

- Turn ignition switch off.
- Loosen and retighten ground screws on the body (See Ground Inspection in Section 15 Body & Accessories).
- Inspect ground connection C-202 mounting position (See Vehicle Wiring Harness Layout - Main Harness in Section 16 Wiring).

Is the ground connection OK?

Yes >> Go to the next step.

No >> Repair or replace ground harness or connections.

2. CHECK IMMOBILIZER CONTROL MODULE DTC

- With the scan tool, view DTCs in the Immobilizer control module.
- Refer to DTC confirmation procedure.

Is DTC B3060, B3061 or B3077 present?

Yes >> For DTC B3060, go to step 6.
For DTC B3061, go to the next step.
For DTC B3077, go to step 7.

No >> The condition that caused the DTC is currently not present.
Monitor the scan tool data relative to this circuit while wiggle testing the wiring and connectors and look for the DTC to reset.
- Using the electrical schematic as a guide, inspect the related wiring and connectors of the Immobilizer control module.
- Verify that there is good terminal contact in the related connectors.

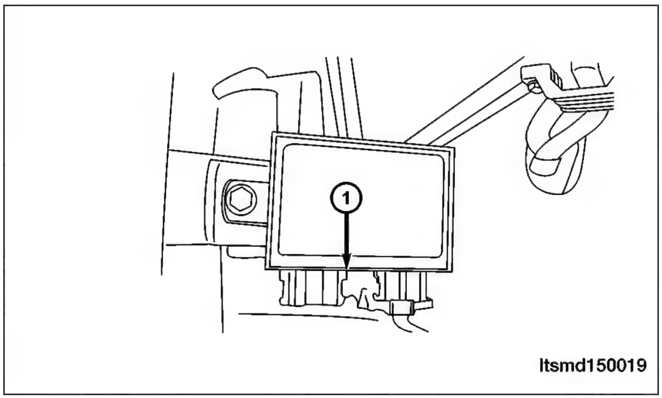
3. CHECK IMMOBILIZER CONTROL MODULE ELECTRICAL CONNECTOR

- Turn ignition switch off.
- Disconnect the Immobilizer control module electrical connector C-026 (1).
- Inspect the electrical connector for damage.

Is the electrical connector OK?

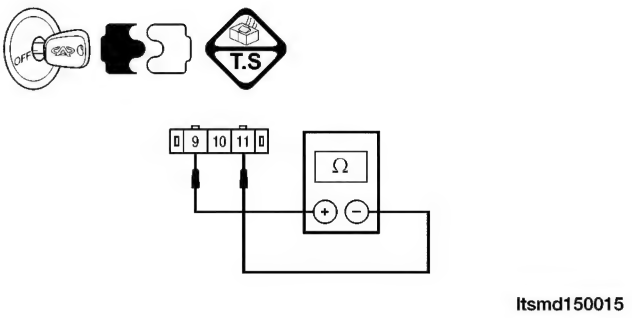
Yes >> Go to the next step.

No >> Repair or replace the electrical connector as necessary.



4. CHECK THE IMMOBILIZER COIL

- Check the resistance between the Immobilizer coil connector C-026, terminal 9 and terminal 11.

IMMOBILIZER COIL TERMINAL	IMMOBILIZER COIL TERMINAL	
9	11	

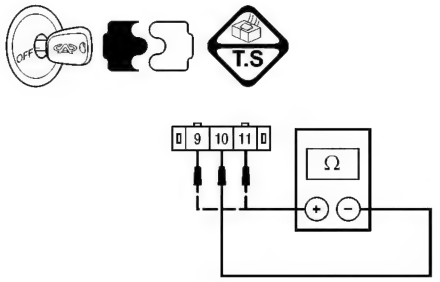
Does the resistance range from 5 to 20 ohms?

Yes >> Go to the next step.

No >> Replace the Immobilizer coil.

5. CHECK IMMOBILIZER COIL

- Check the resistance between the Immobilizer coil connector C-026, terminal 9 and terminal 10.
- Check the resistance between the Immobilizer coil connector C-026, terminal 11 and terminal 10.

IMMOBILIZER COIL TERMINAL	IMMOBILIZER COIL TERMINAL	CONTINUITY	 ltsmd150016
9	10	None	
11	10		

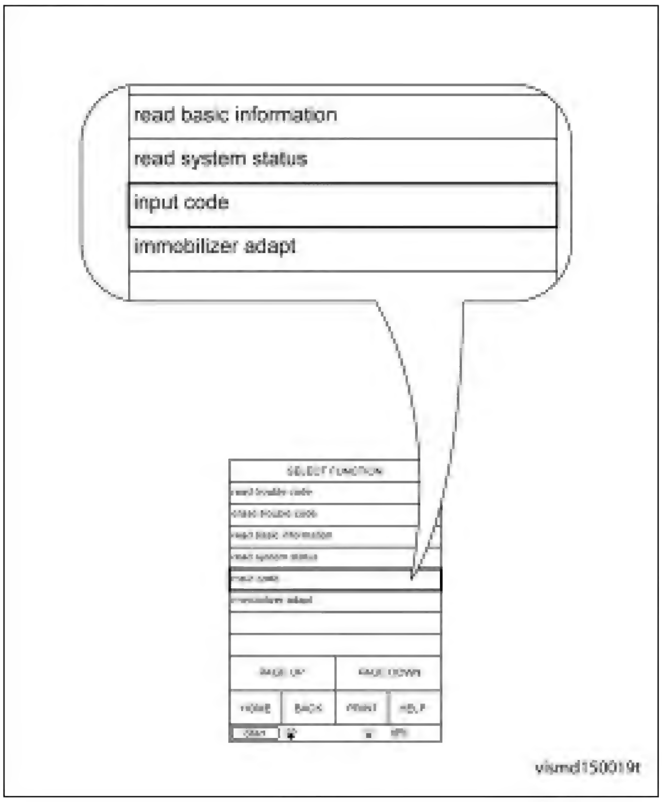
Is the check result normal?

Yes >> Go to the next step.

No >> Replace the Immobilizer coil.

6. PROGRAM THE TRANSPONDER

- Using the X-431 scan tool, program the vehicle security system.
- Turn ignition switch on and perform the following:
  - With the X-431 scan tool, choose A1 series.
  - Choose ″immobilize″.
  - Choose ″input code″.
  - Input the safety code.
  - Click the small keyboard.
  - Click ″OK″.
  - Choose ″Immobilizer adapt″.
  - Choose ″Key learning″ immediately.
  - Click ″OK″.



- Try to start the engine.
- With the X-431 scan tool, view active DTCs in the Immobilizer control module.

Is DTC B3060, B3061 or B3077 present?

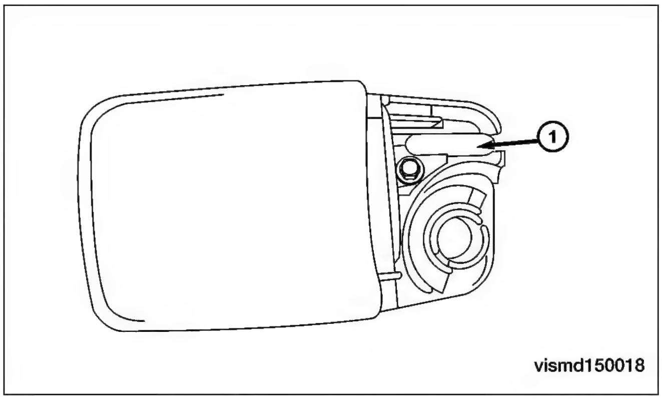
Yes >> Go to the next step.

No >> No problem found at this time.
This concern may have been caused by an unprogrammed transponder.
Erase all codes before returning the vehicle to the customer.

7. REPLACE AND MATCH THE TRANSPONDER

- Replace the chip (1) with a new one.
- Turn ignition switch on.
- Repeat step 5.
- Attempt to start the engine.
- With the X-431 scan tool, view DTCs in the Immobilizer control module.

Is DTC B3060, B3061 or B3077 present?



Yes >> Go to the next step.

No >> No problem found at this time.
This concern may have been caused by the transponder fault.
Erase all codes before returning the vehicle to the customer.

8. VERIFY NEW IMMOBILIZER CONTROL MODULE

- Attempt to start the engine.
- With the X-431 scan tool, view active DTCs in the Immobilizer control module.

Is DTC B3060, B3061 or B3077 present?

Yes >> Go to the next step.

No >> No problem found at this time.
This concern may have been caused by the Immobilizer control module fault.
Erase all codes before returning the vehicle to the customer.

9. REPLACE AND MATCH ECM

- Using the electrical schematic as a guide, inspect the related wiring and connectors of the ECM.
- Verify that there is good terminal contact in the related connectors.
- Attempt to start the engine.
- With the X-431 scan tool, view active DTCs in the Immobilizer control module.

Is DTC B3060, B3061 or B3077 still present?

Yes >> Replace the ECM and match the Immobilizer control module to the new ECM (See ECM Removal & Installation in Section 03 Electronic Engine Controls).

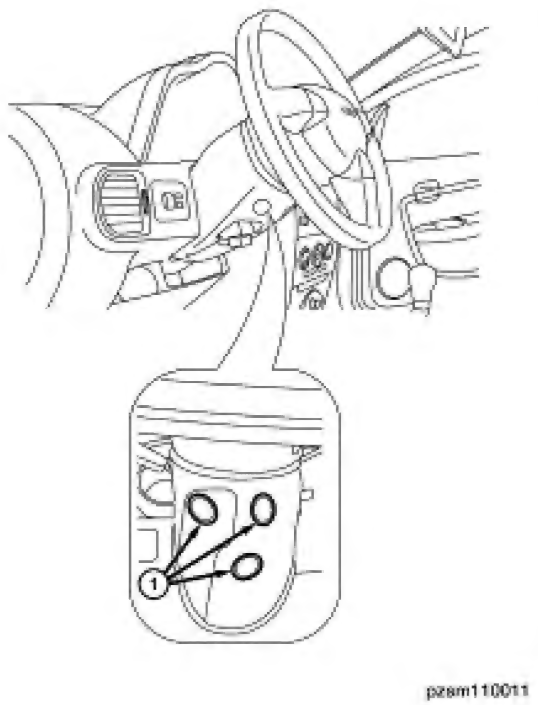
No >> No problem found at this time.
This concern may have been caused by a loose or corroded terminal or connector.
Erase all codes before returning the vehicle to the customer.

ON-VEHICLE SERVICE

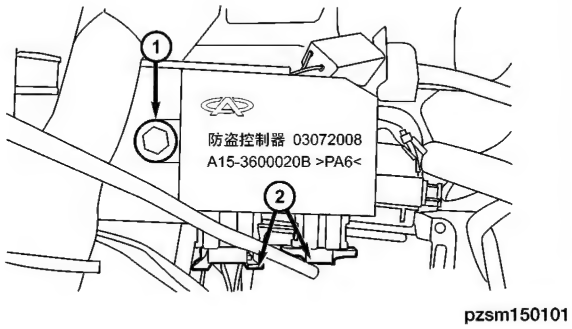
Immobilizer Control Module

Removal & Installation

1. Remove the steering column shroud lower retaining bolts (1).


1
pzsm110011

2. Remove the Immobilizer control module retaining bolt (1).
3. Disconnect the Immobilizer control module electrical connectors (2).


1
防盗控制器 03072008
A15-3600020B >PA6<
2
pzsm150101

4. Remove the Immobilizer control module.
5. Installation is in the reverse order of removal.

Installation Notes:

NOTE :
The Immobilizer control module must be matched to the ECM before the vehicle will start.

Matching Engine Control Module (ECM) To New Immobilizer Control Module

Perform the following to match the ECM to the Immobilizer control module:

- With the X-431 scan tool, choose A1 series.
- Choose ″immobilize″.
- Choose ″input code″.
- Input the safety code.
- Click the small keyboard.
- Click ″OK″.
- Choose ″Immobilizer adapt″.
- Choose ″read EMS to Immobilizer″ immediately.
- Click ″OK″.

Remote Keyless Entry (RKE) Inoperative

No Response From Remote Keyless Entry (RKE) Transmitter

1. CHECK TRANSMITTER BATTERY

- Check the battery of the RKE transmitter.

Is the battery voltage of the RKE transmitter normal?

Yes >> Go to the next step.

No >> This concern has been caused by the transmitter battery.
Go to step 4.

2. CHECK THE IGNITION LOCK CYLINDER CONDITION

- Check the ignition lock cylinder for proper operation.

Is the check result normal?

Yes >> Go to the next step.

No >> Repair or replace the ignition lock cylinder key switch.

3. PERFORM THE RKE TRANSMITTER MATCH PROCEDURE

- Close all the doors.
- Insert the ignition key into the ignition switch which has lost synchronization in LOCK position.
- Press any button on the RKE transmitter within 5 seconds.
- Pull the ignition key out of the ignition switch.
- Try to operate the RKE transmitter.

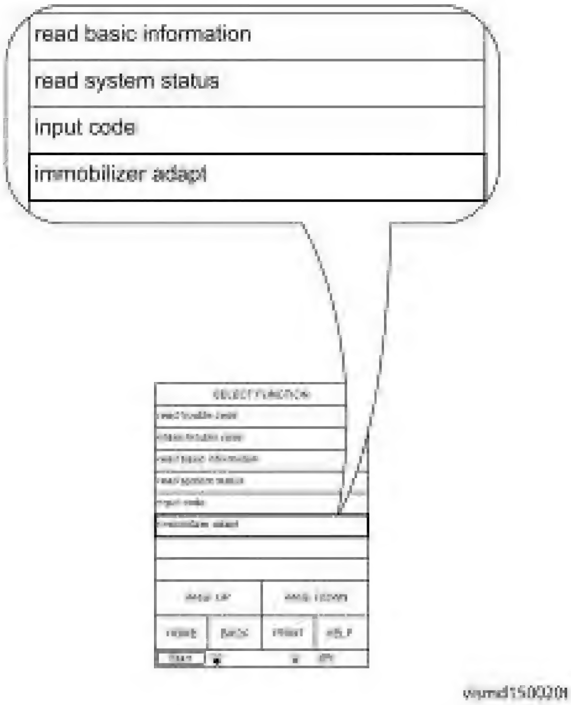
Does the RKE transmitter operate properly?

Yes >> Erase all codes before returning the vehicle to the customer.

No >> Go to the next step.

4. PERFORM THE RKE TRANSMITTER MATCH WITH THE X-431

- Replace the RKE transmitter.
- Connect the X-431 scan tool to the Data Link Connector (DLC), press the POWER key to start the X-431 (use the most current software available).
- Turn ignition switch on.
  - Enter the Diagnostic Program.
  - Select Chery main program.
  - Select diagnostic version.
  - Enter download program.
  - Select A1 series, and then select ISU.
  - Select ″Remoter Match″.



- Remove the key from the ignition switch.
- Press the lock button on the RKE transmitter for less than 2 seconds.
- Try to operate the RKE transmitter.

Does the RKE transmitter operate properly?

Yes >> Then click OK to rematch the other RKE transmitter according to the display.
Erase all codes before returning the vehicle to the customer.
The concern was caused by the RKE transmitter.

No >> Replace the BCM (See BCM Removal & Installation in Section 15 Body & Accessories).
Match the RKE transmitter to the BCM with the X-431 scan tool. For detailed instructions, go to step 4.

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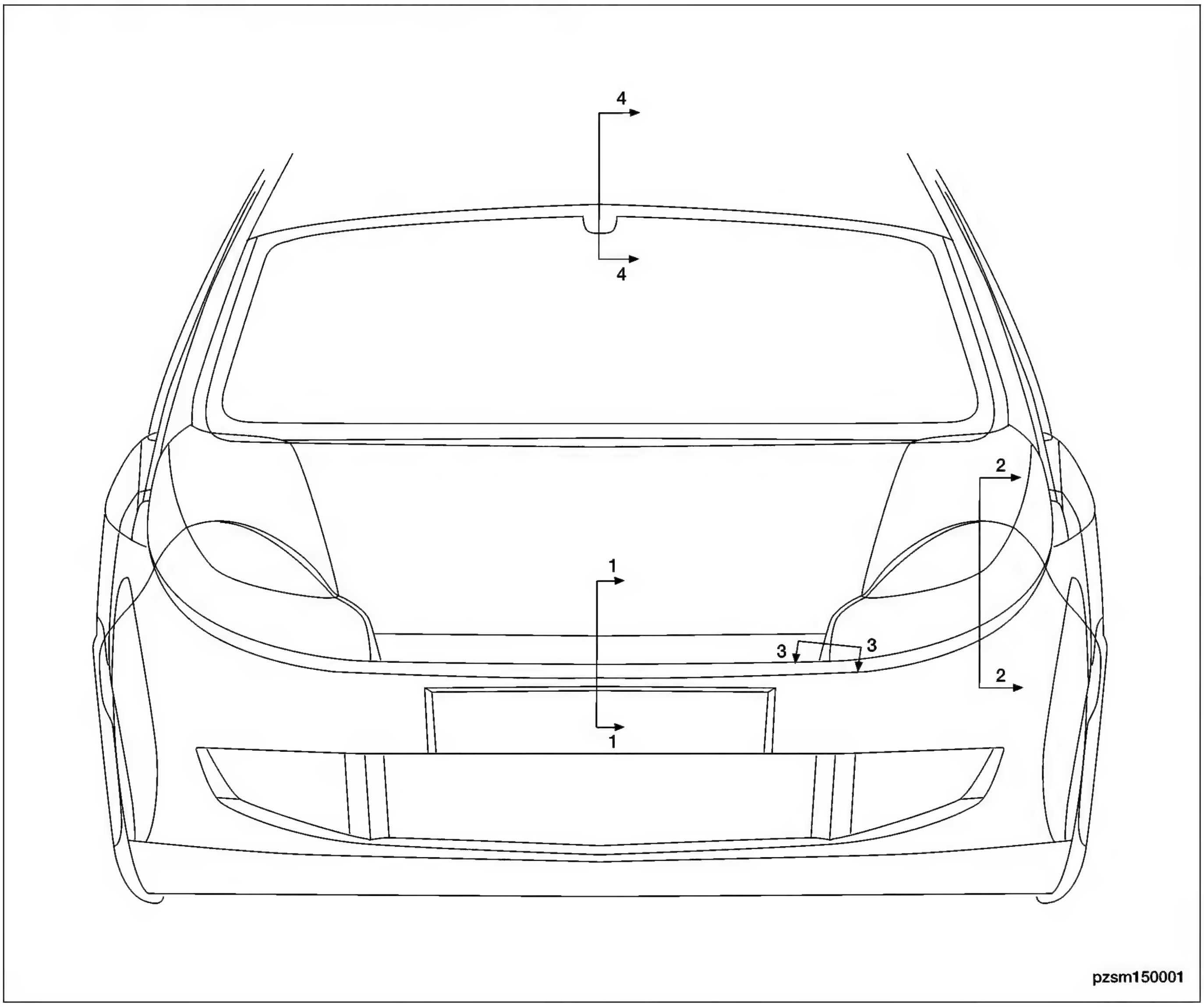
BODY DIMENSIONS

Description

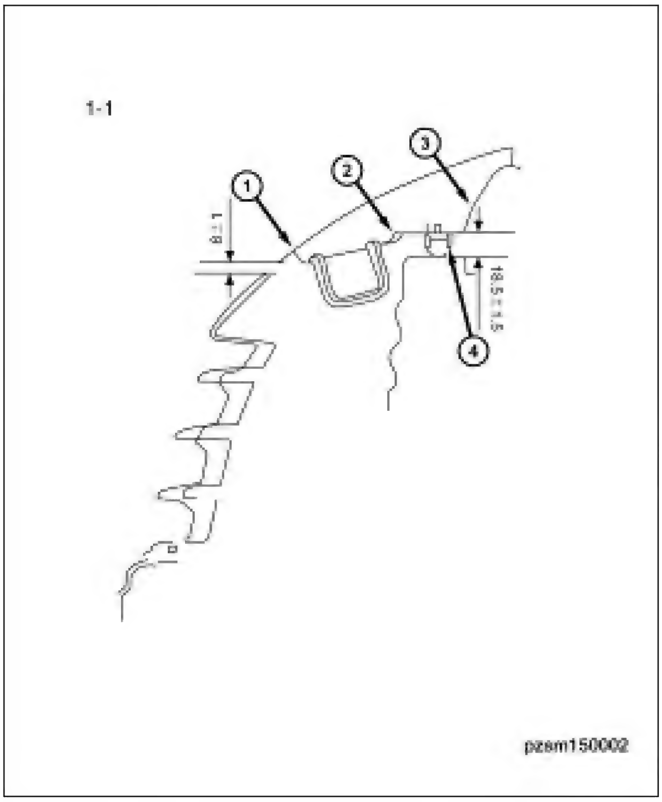
- All measurements should be made from the bare metal, remove trim and bumper covers as necessary.
- Repair any badly damaged areas before taking measurements for underbody alignment.
- Monitor the upper body structure for excessive stress or movement while making any corrections to the underbody structure.
- Remove all the necessary glass to prevent breakage.
- All dimensions are shown in millimeters (mm).

Front View

Body Front View Dimensions (Units: mm)

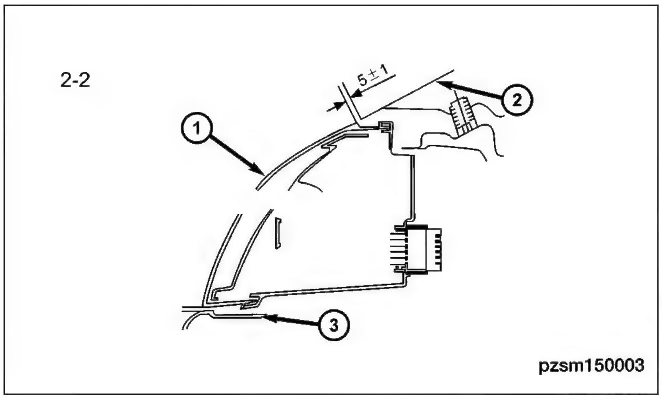


Clearance between front hood and air inlet grid at 1-1: 8 ± 1 mm


1-1
8±1
18.5±1.5
1
2
3
4
pzsm150002

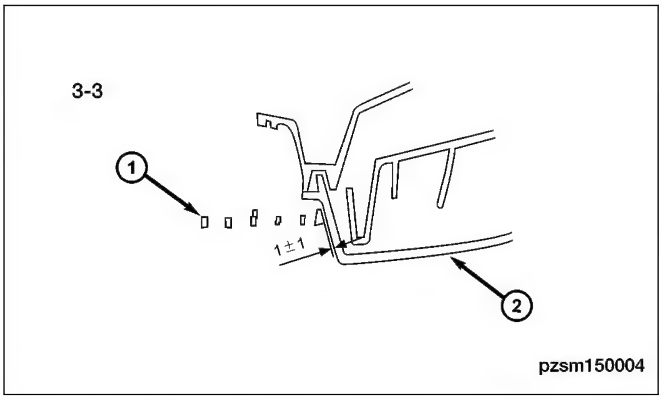
1 - Front Compartment Cover	3 - Inner Layer Of Front Compartment Cover
2 - Latch Supporting Plate	4 - Front Compartment Cover Seal Strip

Clearance between front hood and headlamp at 2-2: 5 ± 1 mm


2-2
5±1
1
2
3
pzsm150003

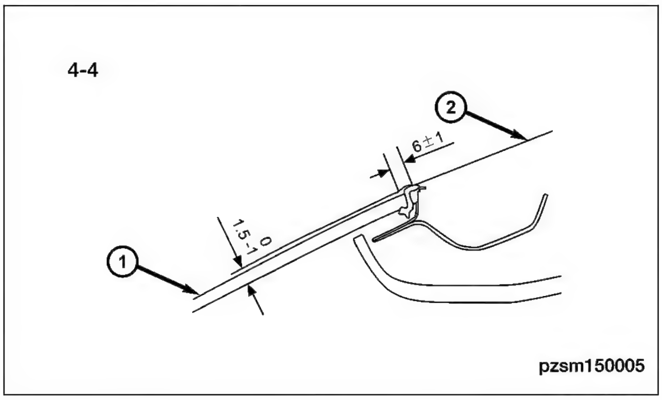
1 - Headlamp	2 - Front compartment cover	3 - Front Bumper

Clearance between headlamp and air inlet grid at 3-3: 1 ± 1 mm


3-3
1
1±1
2
pzsm150004

1 - Air Inlet Grille	2 - Headlamp

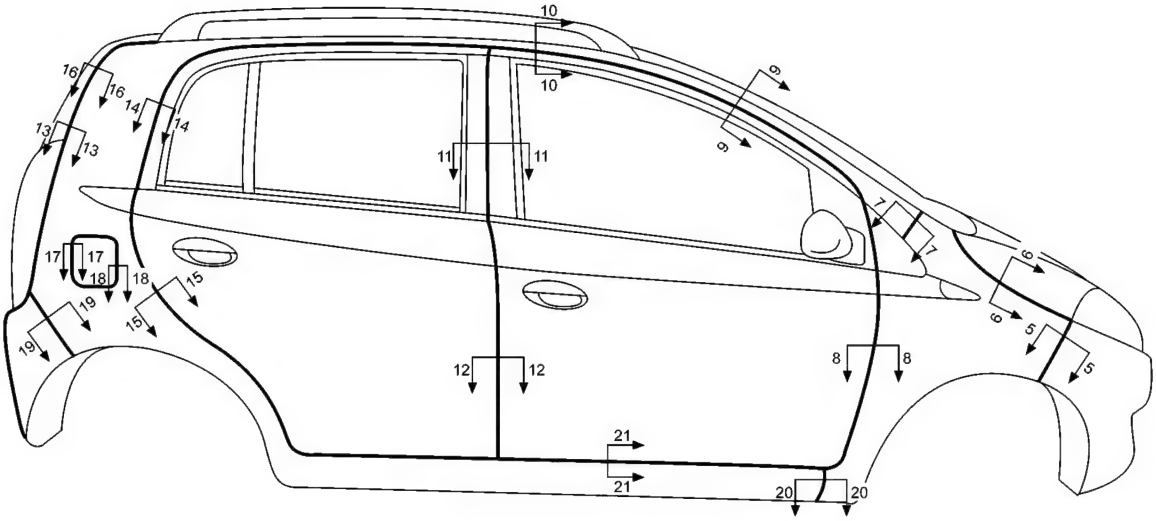
Clearance between the front windshield and the vehicle roof at 4-4: 6 ± 1 mm


4-4
2
6±1
1.5-1 0
1
pzsm150005

1 - Front Windscreen	2 - Vehicle Roof

Left-Front View

Body Left-Front Dimensions (Units: mm)


10
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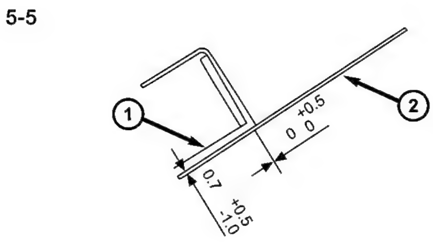
21
21
20
20

pzsm150006

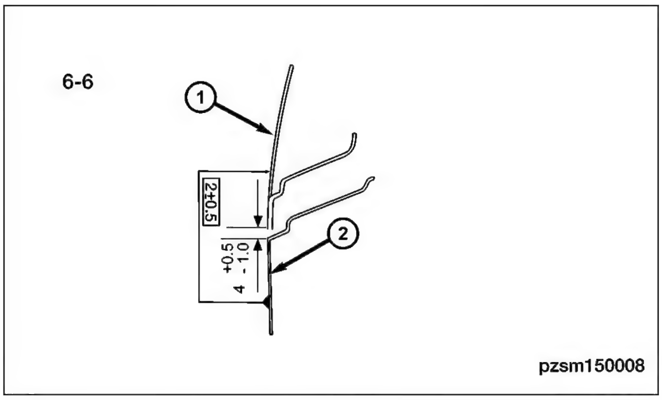
Clearance between front bumper and front fender at 5-5: 0 + 0.5 mm


5-5
1
2
+0.5
0 0
0.7 +0.5
-1.0

pzsm150007

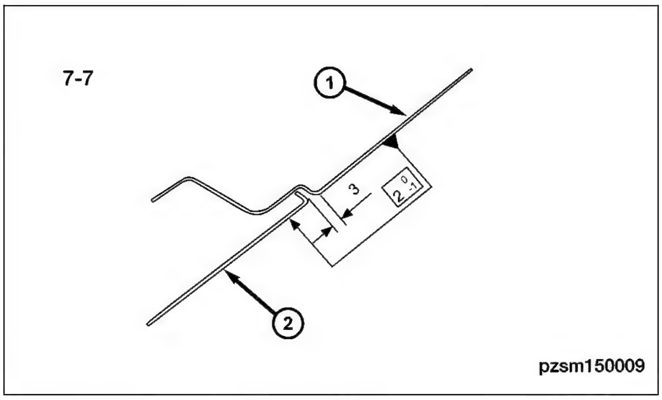
1 - Front Bumper	2 - Front Fender

Clearance between front hood and front fender at 6-6: 4 mm


6-6
1
2±0.5
4 +0.5 -1.0
2
pzsm150008

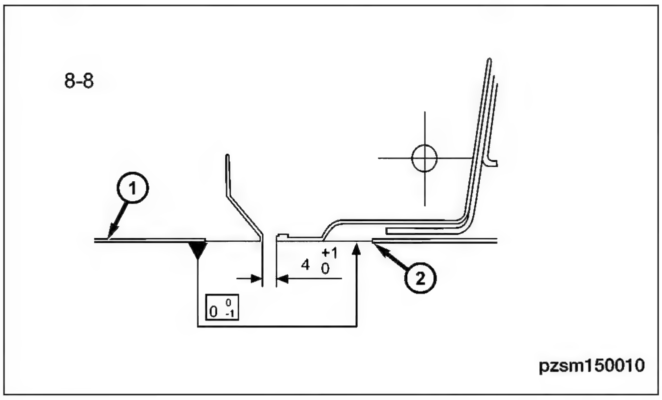
1 - Front Compartment Cover	2 - Front Fender

Clearance between front fender and A-pillar (side wall) at 7-7: 3 mm


7-7
1
3
2 0 -1
2
pzsm150009

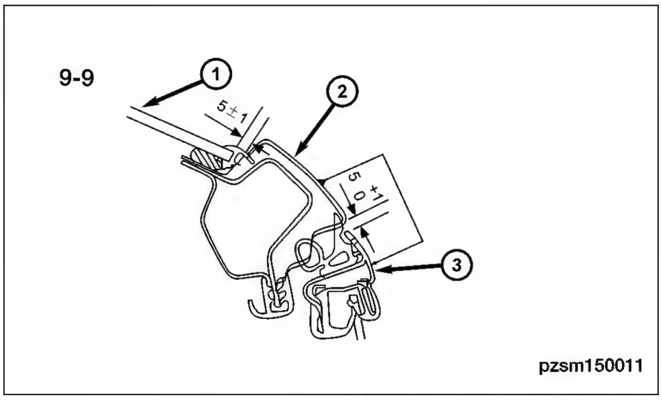
1 - A-pillar	2 - Front Fender

Clearance between front fender and front vehicle doors at 8-8: 4 + 1 mm


8-8
1
4 +1 0
0 0 -1
2
pzsm150010

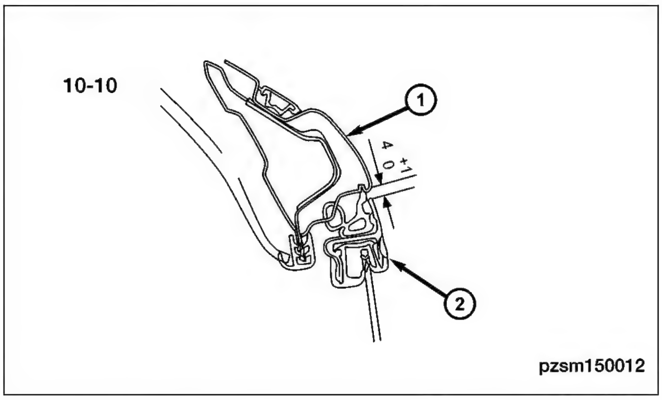
1 - Front Fender	2 - Front Door

Clearance between front door and A-pillar (side wall) at 9-9: 5 ± 1 mm


9-9
1
2
3
5±1
5 +1 0
pzsm150011

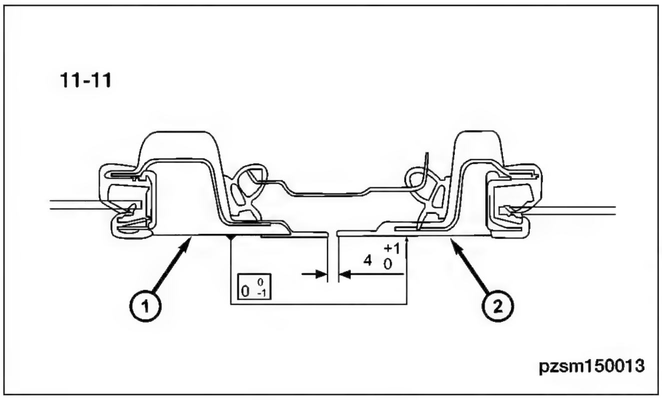
1 - Vehicle Roof	2 - A Pillar	3 - Front Door

Clearance between front vehicle doors and vehicle roof 10-10: 4 + 1 mm


10-10
1
2
4 +1 0
pzsm150012

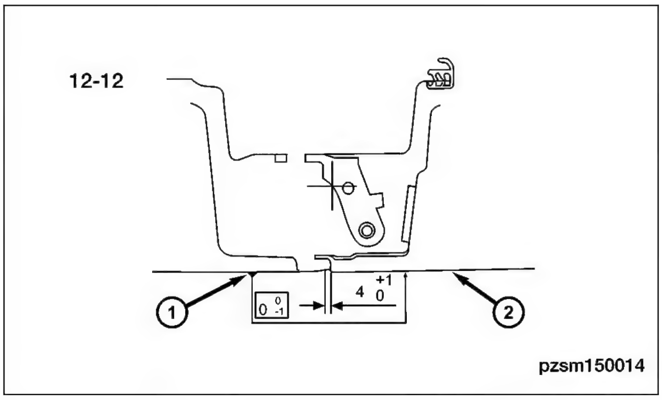
1 - Vehicle Roof	2 - Front Door

Clearance between front door and rear door at 11-11: 4 + 1 mm


11-11
1
2
4 +1 0
0 0 -1
pzsm150013

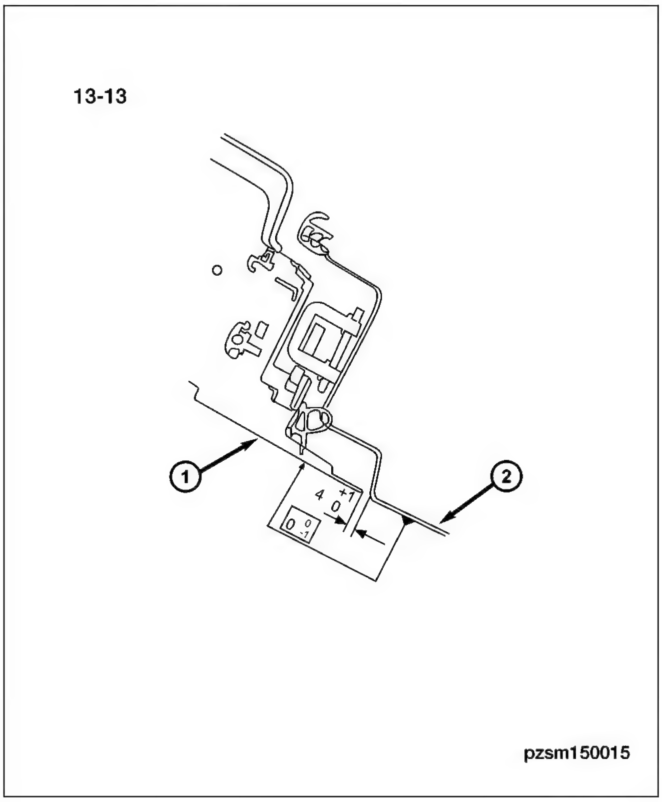
1 - Front Door	2 - Rear Door

Clearance between front door and rear door at 12-12: 4 + 1 mm


12-12
4 +1 0
0 0 -1
1
2
pzsm150014

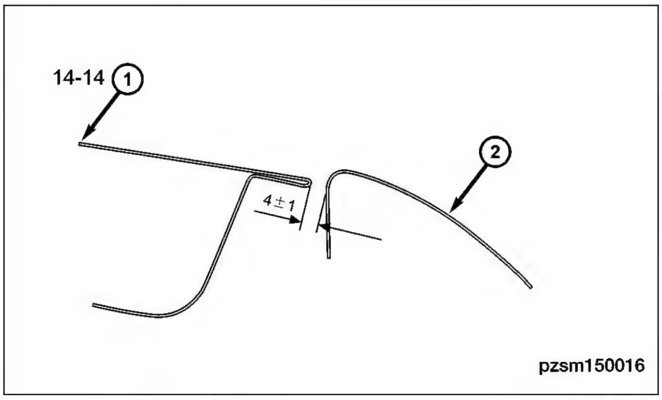
1 - Front Door	2 - Rear Door

Clearance between rear door and rear fender (side wall) at 13-13: 4 + 1 mm


13-13
4 +1 0
0 0 -1
1
2
pzsm150015

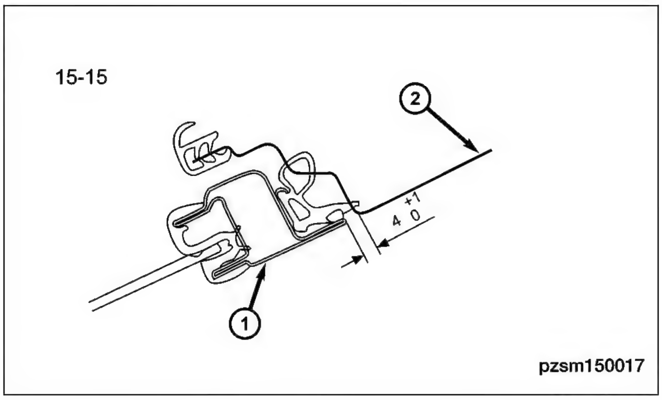
1 - Rear Door	2 - Rear Fender

Clearance between rear door and rear fender (side wall) at 14-14: 4 + 1 mm


14-14
1
2
4±1
pzsm150016

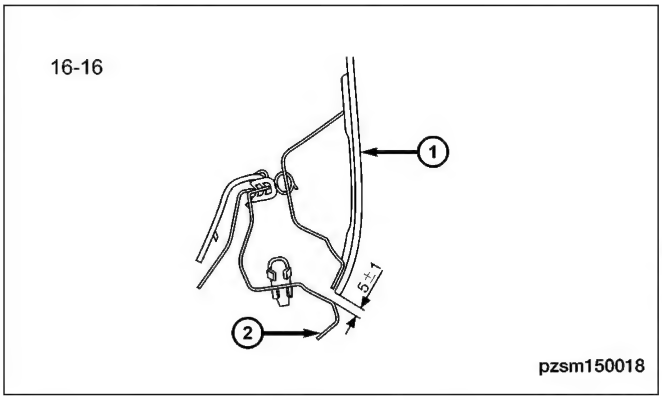
1 - C Pillar	2 - Rear Hatch

Clearance between rear door and C-pillar at 15-15: 4 + 1 mm


15-15
2
1
4 +1 0
pzsm150017

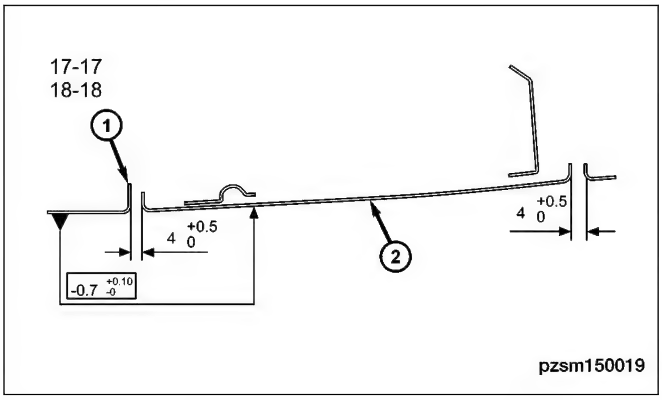
1 - Rear Door	2 - C Pillar

Clearance between rear windshield and C-pillar at 16-16: 5 ± 1 mm


16-16
1
2
5±1
pzsm150018

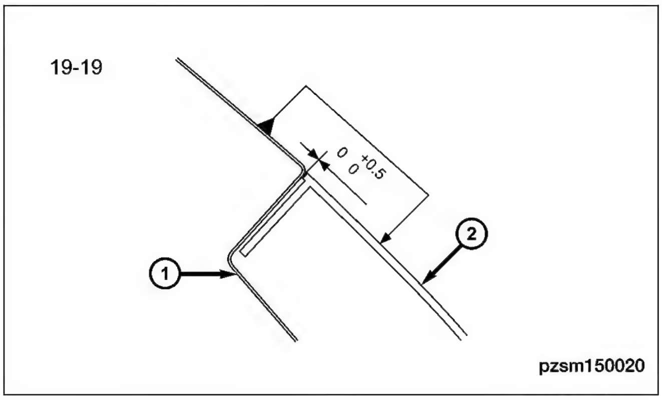
1 - Rear Windscreen	2 - C Pillar

Clearance between gas tank cover and rear fender (side wall) at 17-17 and 18-18: 4 + 0.5 mm


17-17
18-18
1
2
4 +0.5 0
4 +0.5 0
-0.7 +0.10 -0
pzsm150019

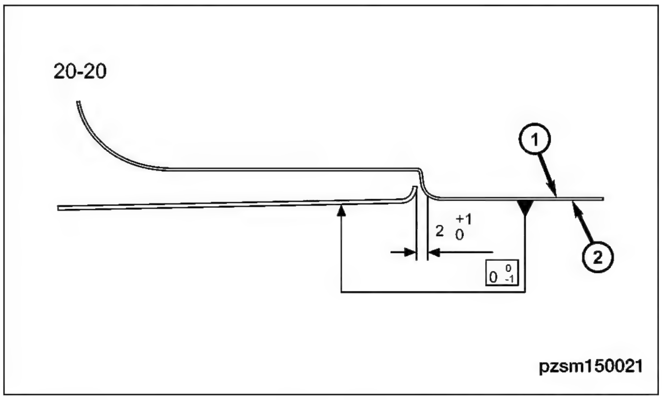
1 - Rear Fender	2 - Gas Tank Cover

Clearance between rear bumper and rear fender at 19-19: 0 + 0.5 mm


19-19
0 +0.5 0
1
2
pzsm150020

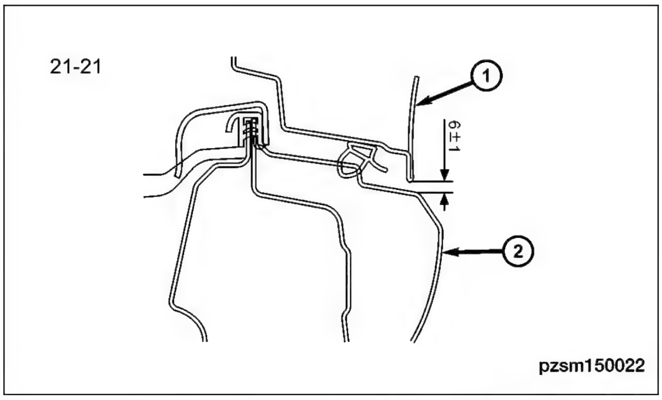
1 - Rear Fender	2 - Rear Bumper

Clearance between front fender and sill decorative board (side wall) at 20-20: 2 + 1 mm


20-20
1
2
2 +1 0
0 0 -1
pzsm150021

1 - Rear Fender	2 - Sill Decorative Board

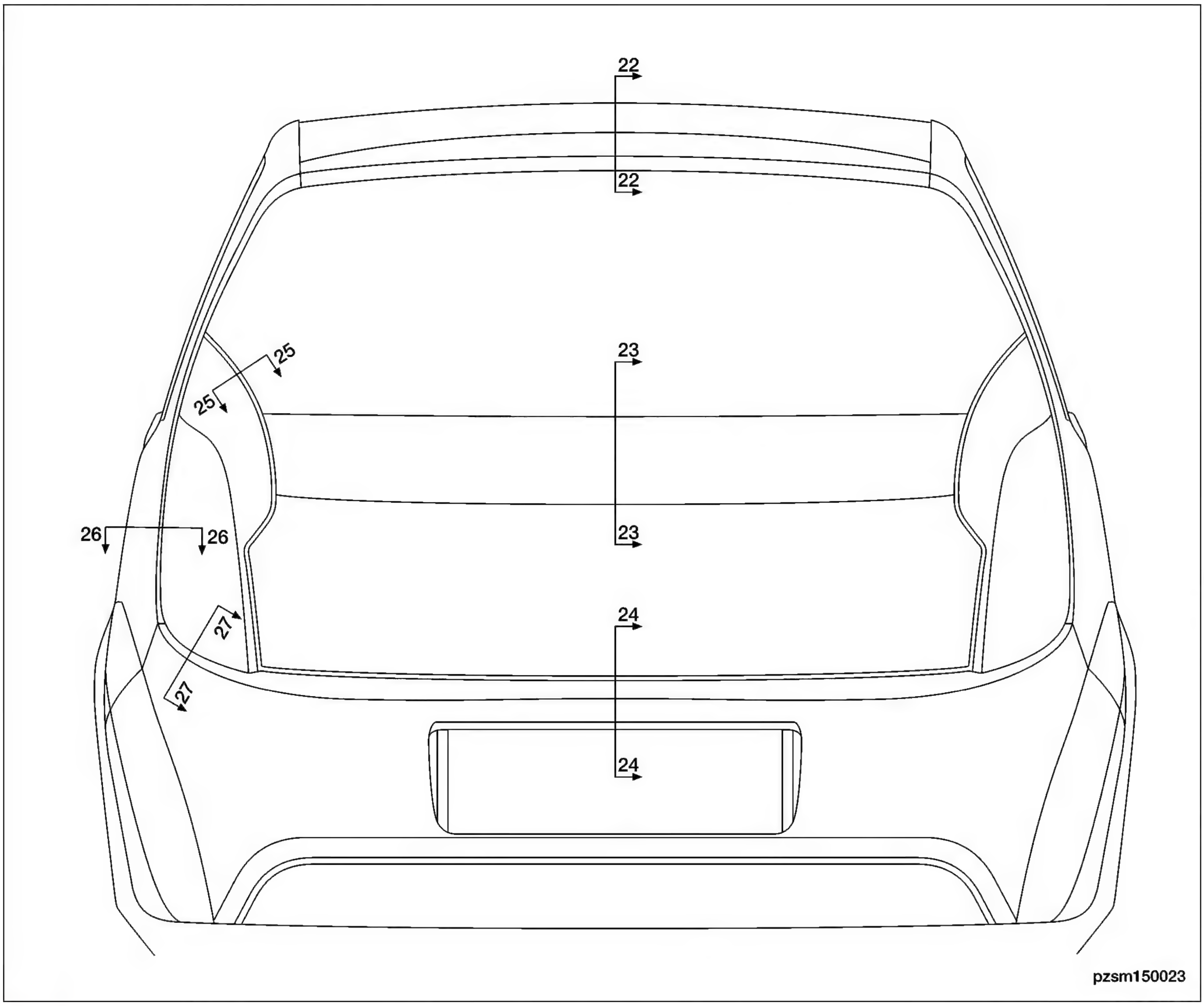
Clearance between front door and sill decorative board (side wall) at 21-21: 6 ± 1 mm


21-21
1
2
6±1
pzsm150022

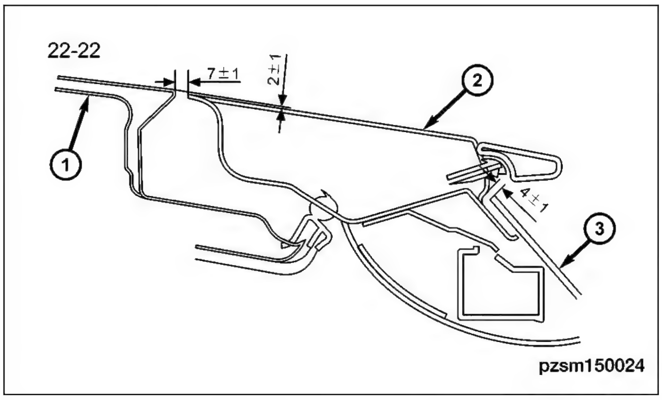
1 - Front Fender	2 - Sill Decorative Board

Back View

Body Back Dimensions

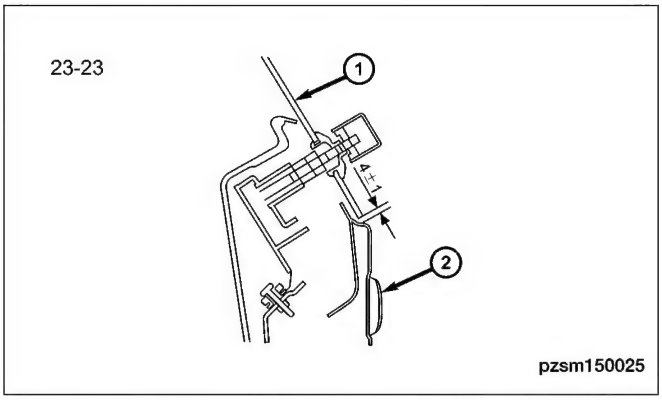

22
22
23
23
24
24
25
25
26
26
27
27
pzsm150023

Clearance between vehicle roof and trunk door at 22-22: 7 ± 1 mm


22-22
7±1
2±1
4±1
1
2
3
pzsm150024

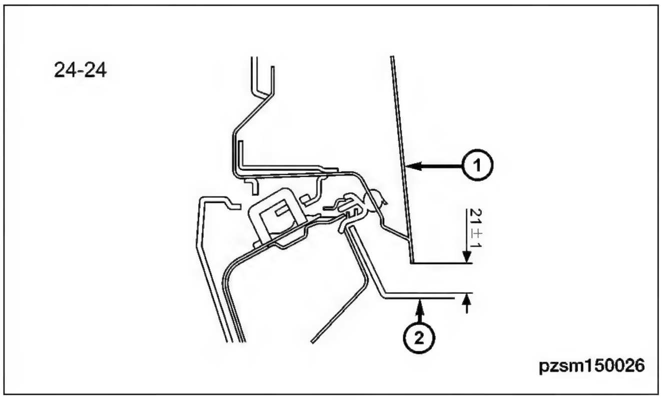
1 - Vehicle Roof	2 - Trunk Door	3 - Rear Windscreen

Clearance between rear window and trunk door at 23-23: 4 ± 1 mm


23-23
4±1
1
2
pzsm150025

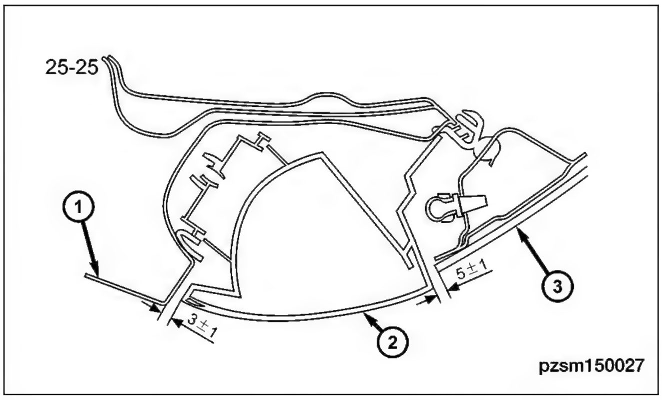
1 - Rear Windscreen	2 - Trunk Door

Clearance between trunk door and rear bumper at 24-24: 21 ± 1 mm


24-24
21±1
1
2
pzsm150026

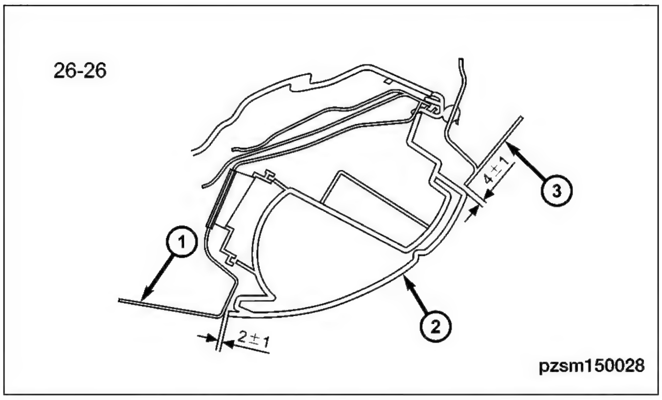
1 - Trunk Door	2 - Rear Bumper

Clearance between rear window and tail lamp at 25-25: 5 ± 1 mm


25-25
1
2
3
3±1
5±1
pzsm150027

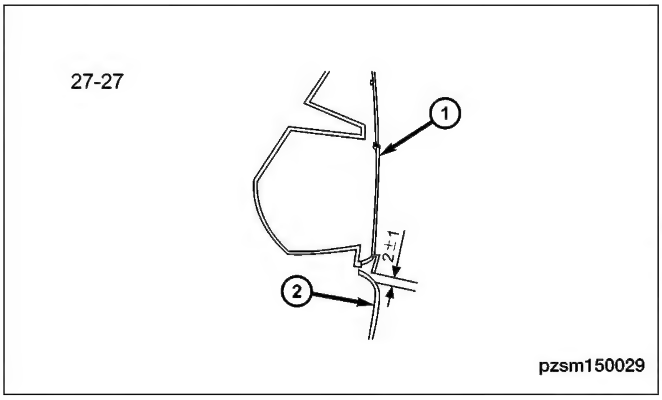
1 - Rear Fender	2 - Tail Lamp	3 - Rear Windscreen

Clearance between tail lamp and rear fender (side wall) at 26-26: 4 ± 1 mm


26-26
1
2
3
2±1
4±1
pzsm150028

1 - Rear Fender	2 - Tail Lamp	3 - Rear Fender

Clearance between tail lamp and rear bumper at 27-27: 2 ± 1 mm

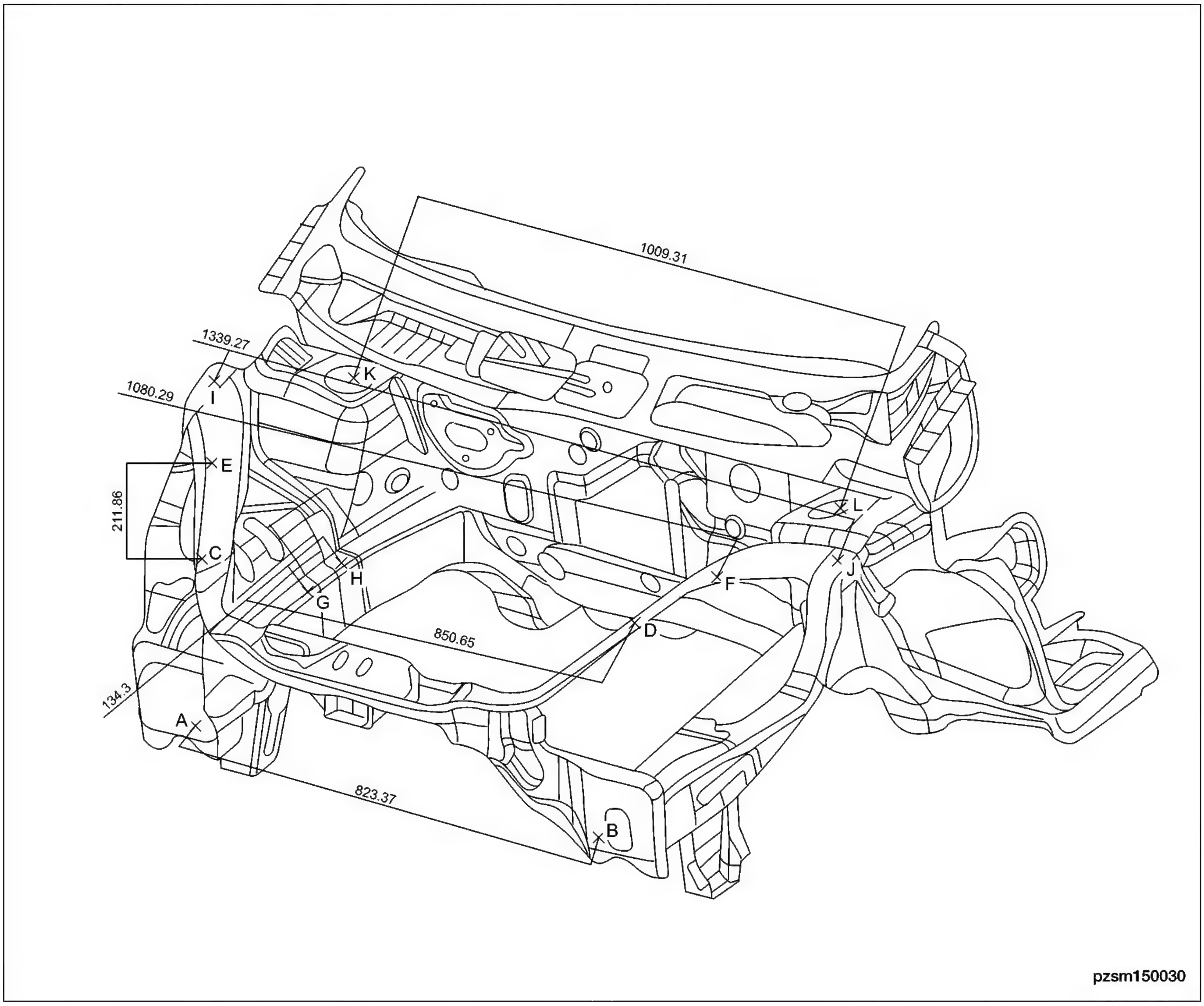

27-27
1
2
2±1
pzsm150029

1 - Tail Lamp	2 - Rear Bumper

15

Engine Compartment

Engine Compartment Dimensions (Units: mm)

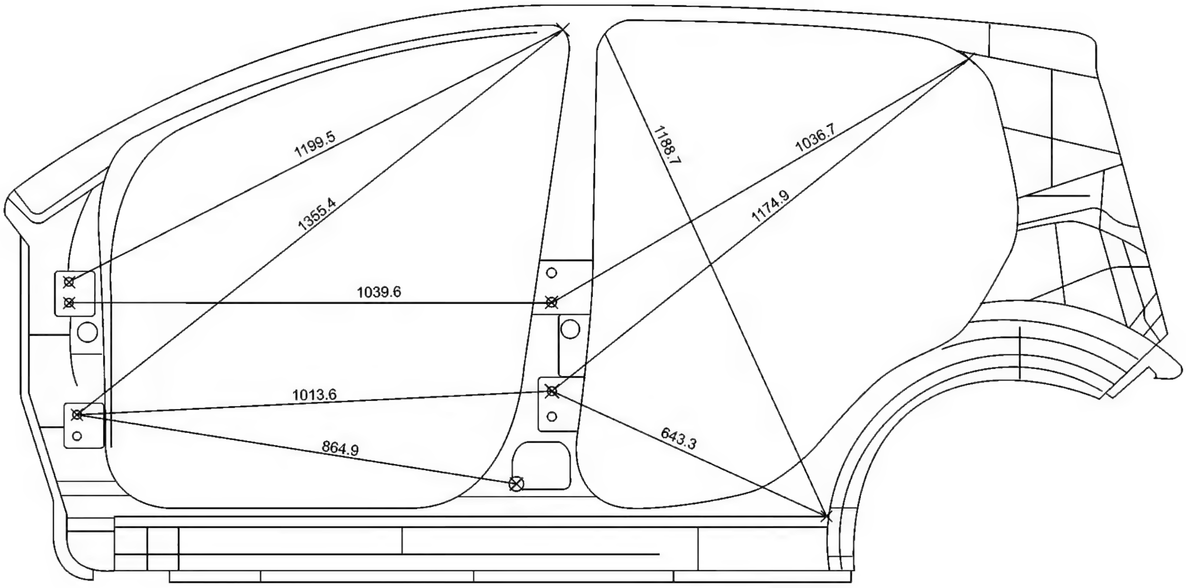

1009.31
1339.27
1080.29
K
I
E
211.86
C
L
J
H
G
F
850.65
D
134.3
A
823.37
B
pzsm150030

NO.	NAME	DIAMETER
A/B	Front Bumper Cross Beam Mounting Hole	Φ 11
C/D/E/F	Headlight Mounting Hole	Φ 7
G/H	Engine Right Suspension Bracket Mounting Hole	Φ 13

NO.	NAME	DIAMETER
I/J	Installation Of Fender	Φ 8
K/L	Shock Absorber Mounting Hole	Φ 76

Body Openings

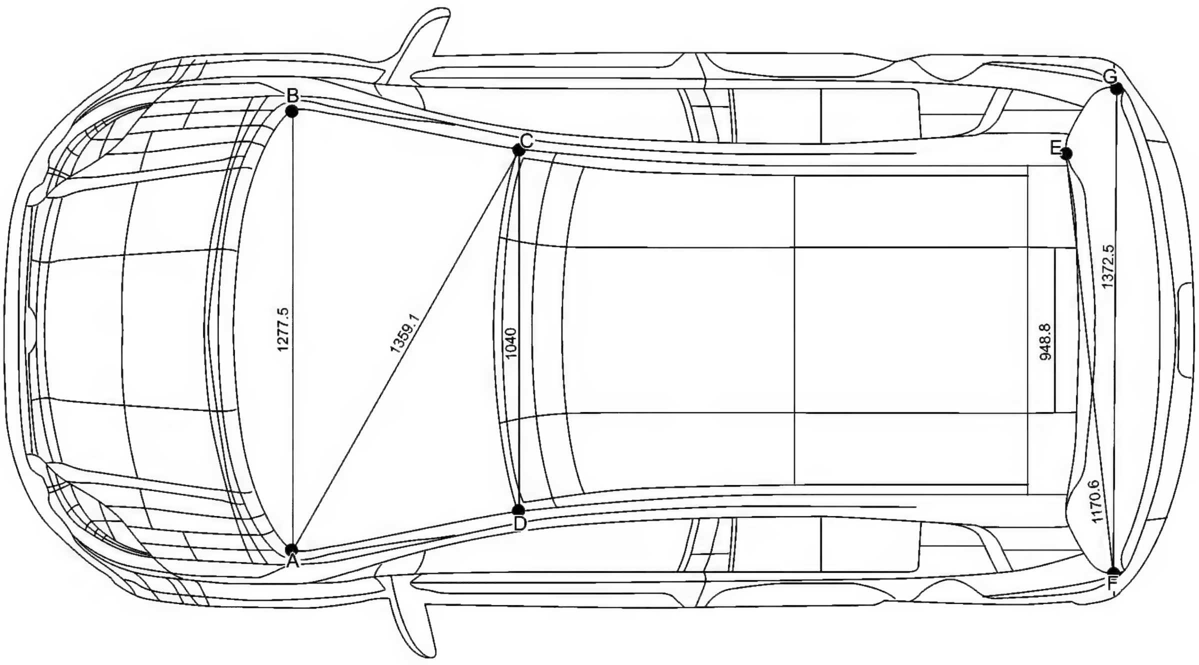
Body Opening Dimensions


1199.5
1355.4
1188.7
1036.7
1174.9
1039.6
1013.6
864.9
643.3

pzsm150031

Windshield

Windshield Dimensions (Units: mm)

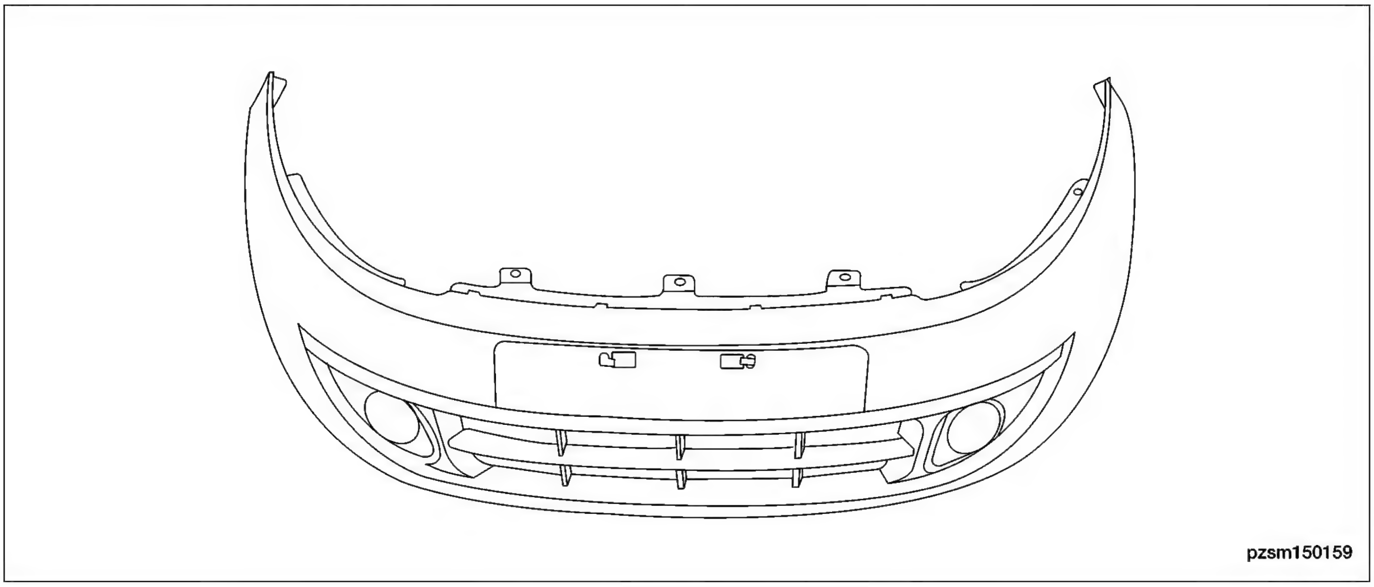

B
C
E
G
1277.5
1359.1
1040
948.8
1372.5
1170.6
A
D
F

pzsm150032

BUMPERS

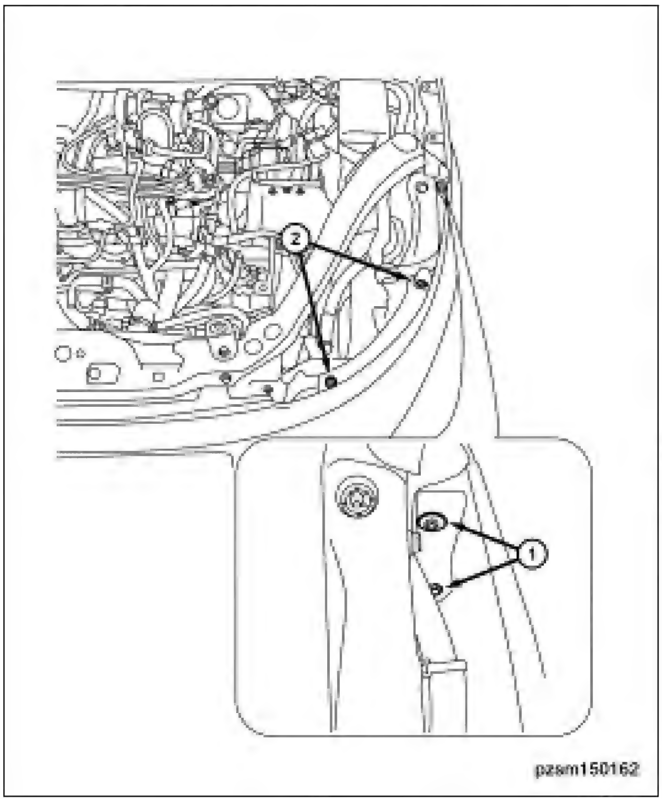
Front Bumper

Removal & Installation



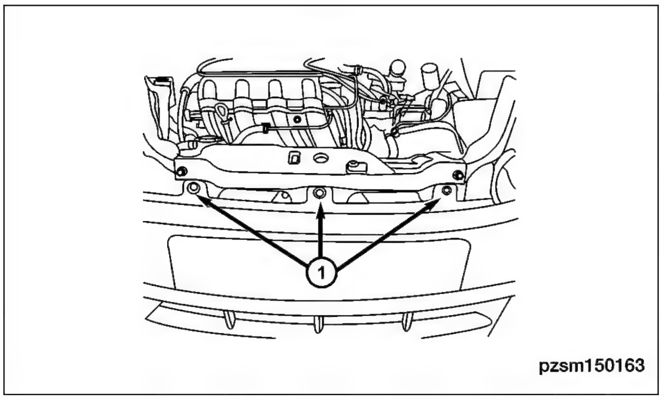
pzsm150159

1. Open the hood.
2. Remove the front combination lamp (See Front Combination Lamp Removal & Installation in Section 15 Body & Accessories).
3. Remove the bumper retaining clips (2) under the combination lamp and the two bumper side retaining bolts (1).

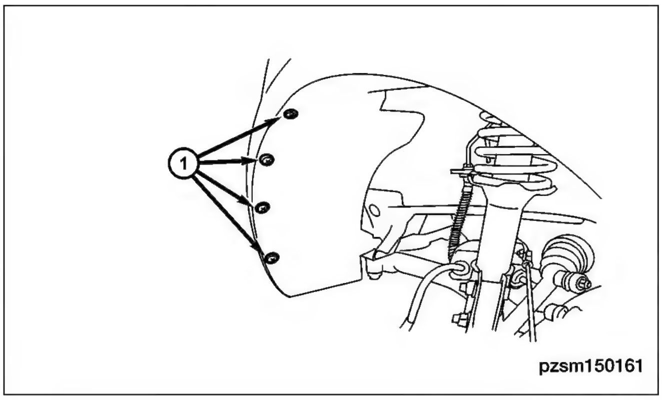


pzsm150162

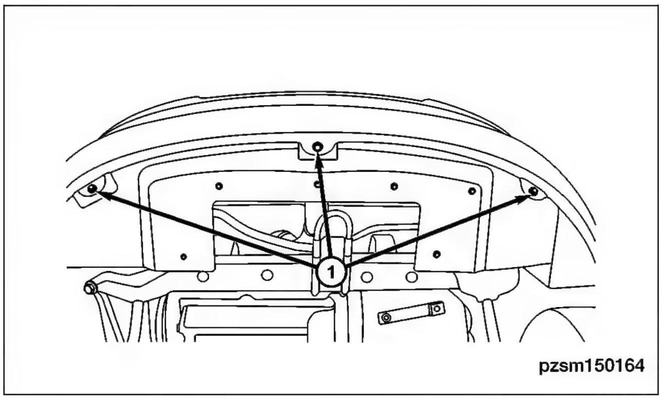
4. Remove the upper bumper three retainers (1).



5. Raise and support the vehicle.
6. Remove the bumper lower side retainers (1).



7. Remove the lower bumper retaining bolts. (Tighten: Lower bumper retaining bolts to 11 ± 1 N·m)

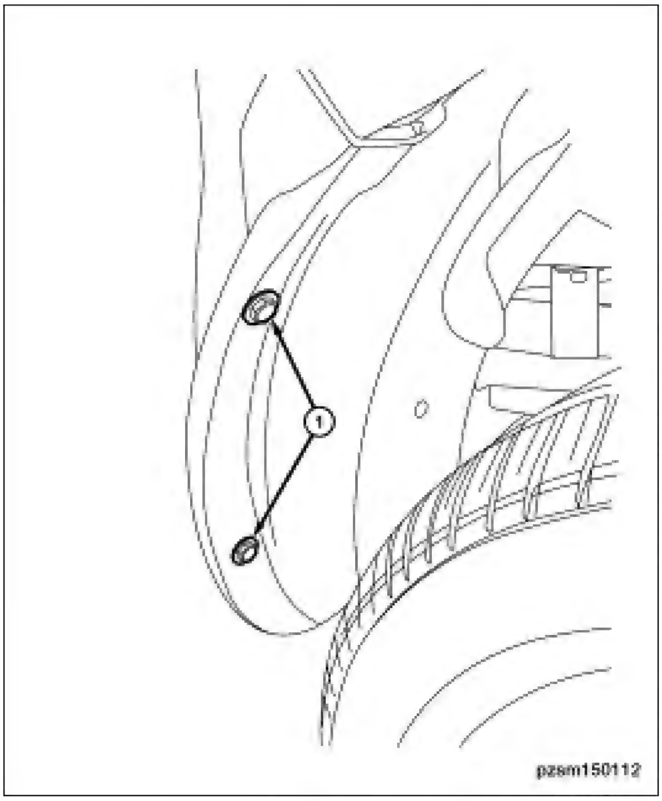


8. Lower the vehicle and remove the front bumper.
9. Disconnect the front fog lamp (left and right).
10. Installation is in the reverse order of removal.

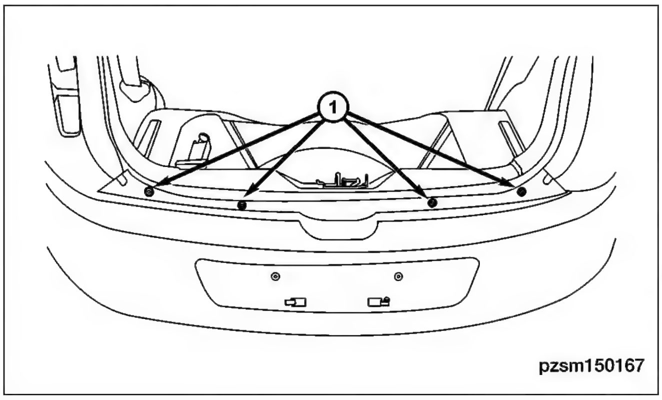
Rear Bumper

Removal & Installation

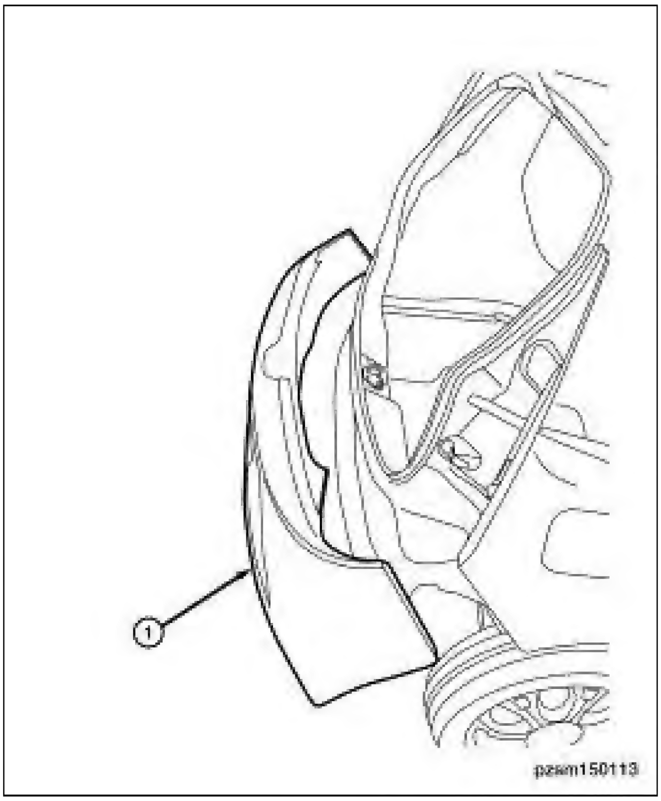
1. Remove the dust shield connecting bolts (1) (left and right).
   (Tighten: Dust shield connecting bolts to 5 ± 0.5 N·m)



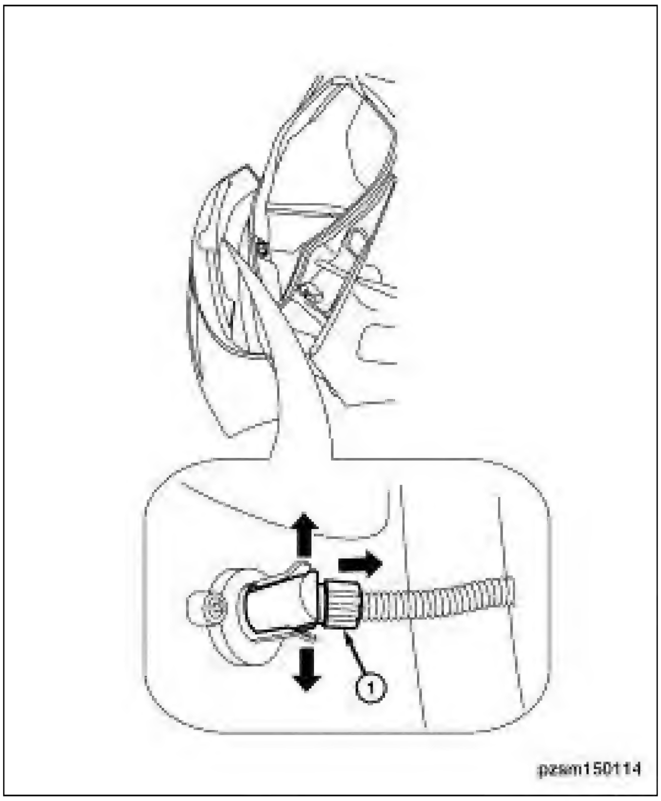
2. Remove the four left and right bumper retaining bolts.
3. Raise the vehicle and remove the bumper lower connecting retainers (1).
4. Lower the vehicle and remove the bumper upper retaining clips (1).



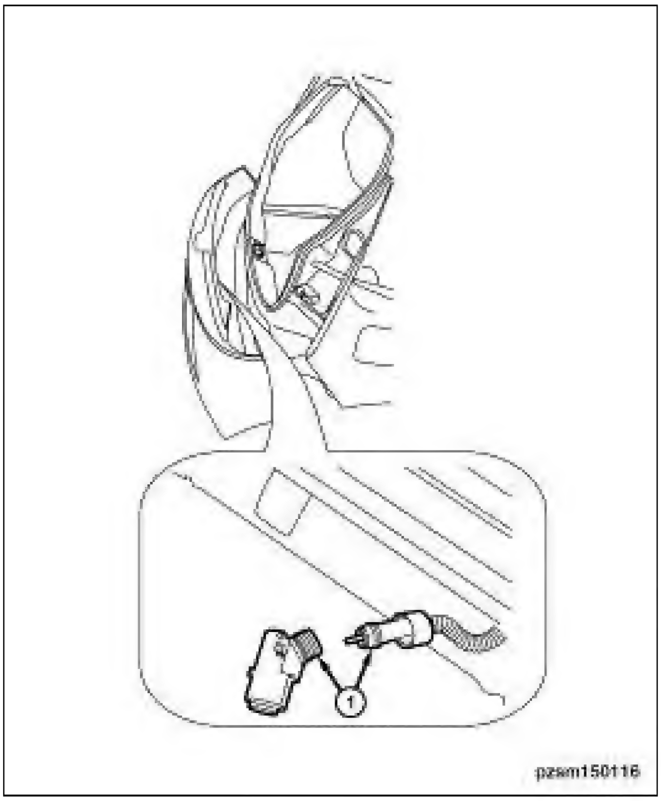
5. Remove the rear bumper (1).


1
pzsm150113

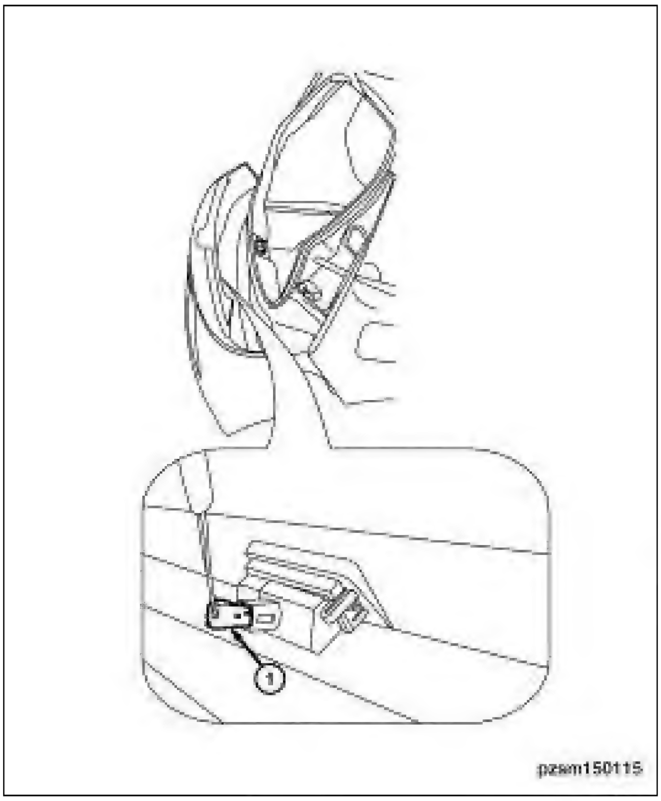
6. Remove the parking sonar (1).


1
pzsm150114

7. Disconnect the parking sonar and remove the sonar sensor (1).


1
pzsm150116

8. Disconnect the license plate lamp electrical connector (1).


1
pzsm150115

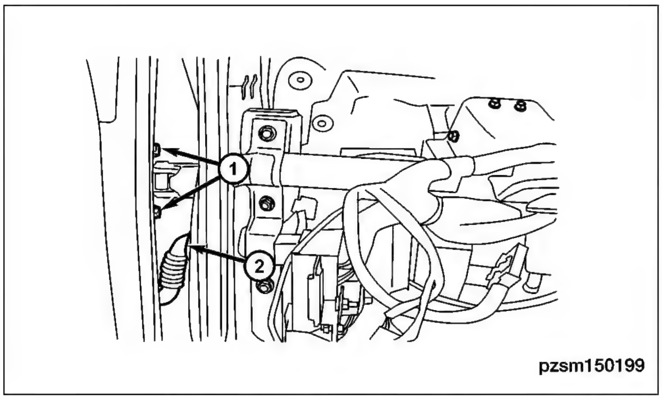
9. Installation is in the reverse order of removal.

DOORS

Front Door

Removal & Installation

1. Turn the ignition switch off.
2. Disconnect the inner electrical harness connector (2) on the front door.
3. Remove the retaining bolts (1) connecting the door and the A-pillar.
   (Tighten: Door retaining bolts to 63 ± 5 N·m)



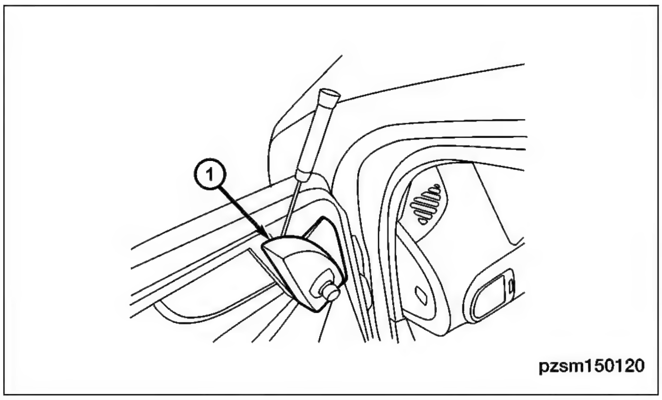
4. Remove the front door.
5. Installation is in the reverse order of removal.

Installation Notes:

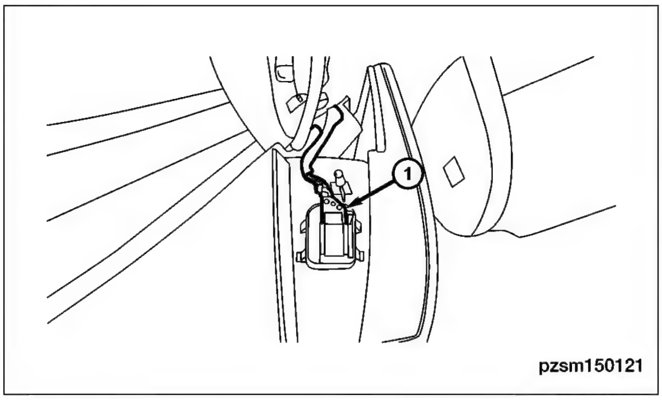
- Adjust the door in the left, right and vertical directions.

Disassembly

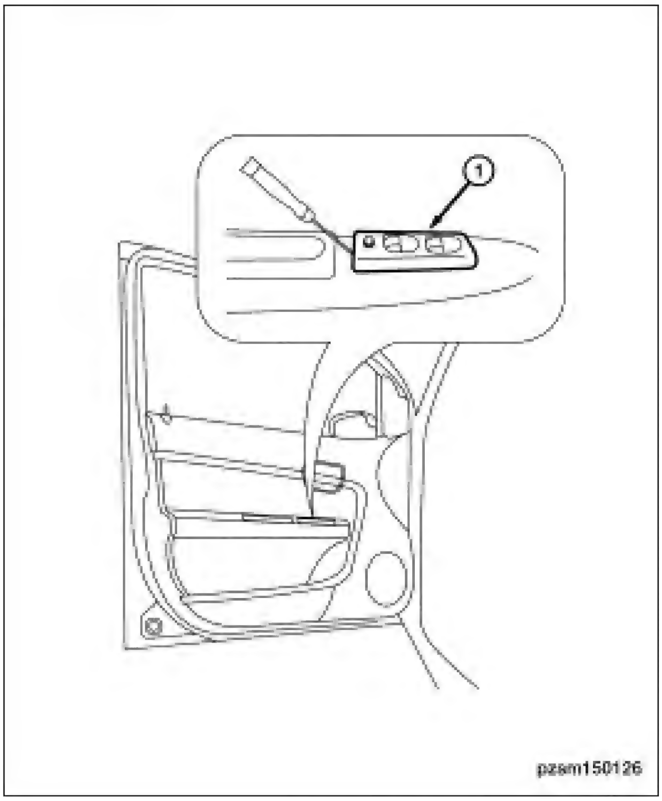
1. Turn the ignition switch off.
2. Using a trim stick, remove the outside mirror switch panel (1) from the door trim panel.



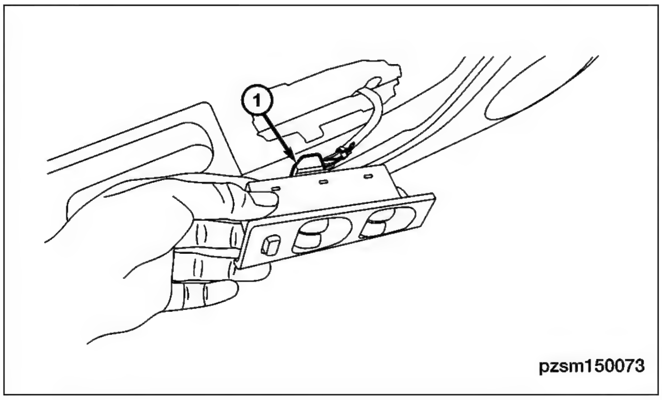
3. Disconnect the outside mirror switch electrical connector (1).



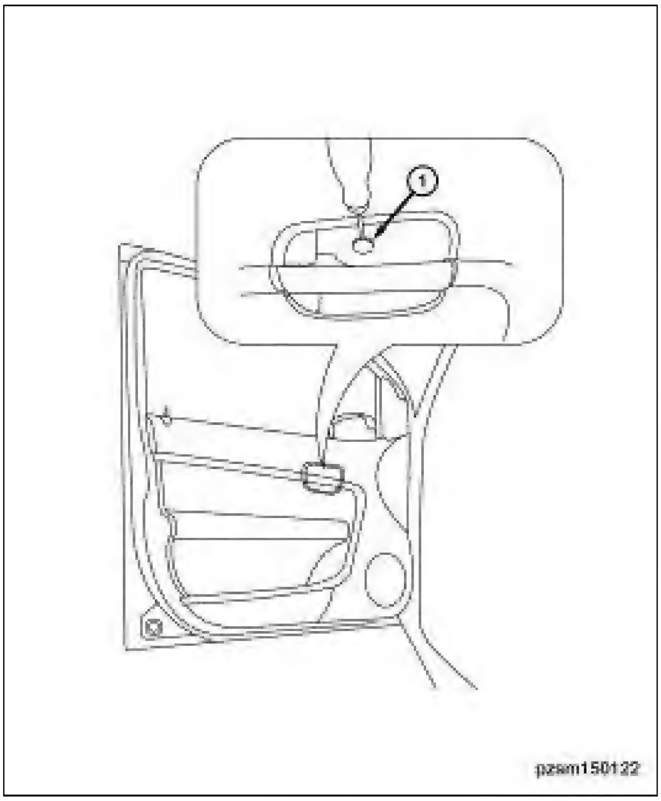
4. Using a trim stick, remove the power window switch assembly (1) on the left front door.


1
pzsm150126

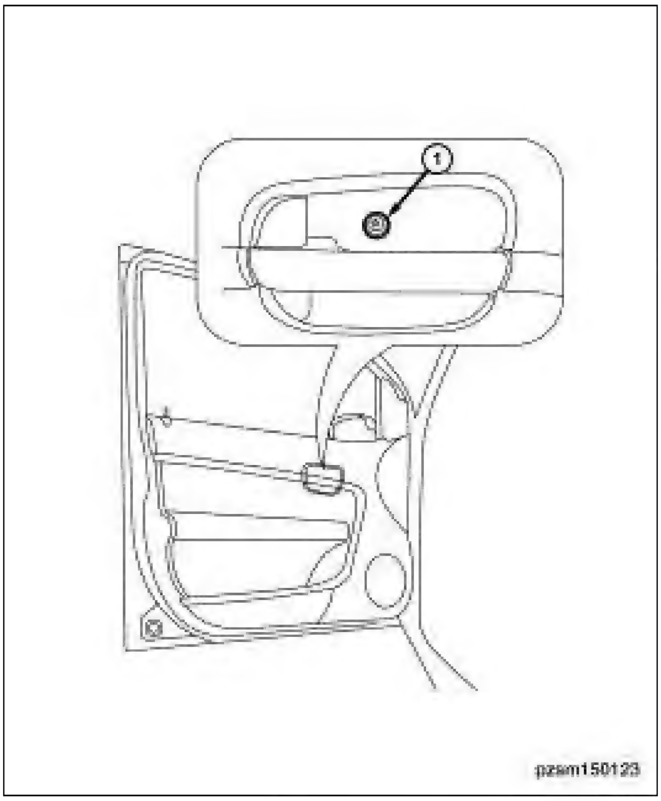
5. Disconnect the power window switch electrical connector (1).


1
pzsm150073

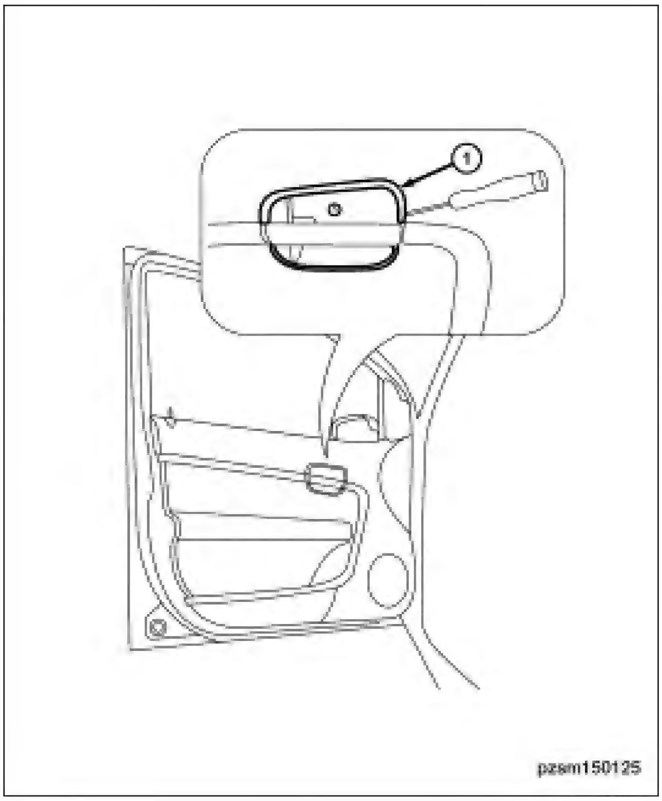
6. Using a trim stick, remove the inside door handle retaining screw cover (1).


1
pzsm150122

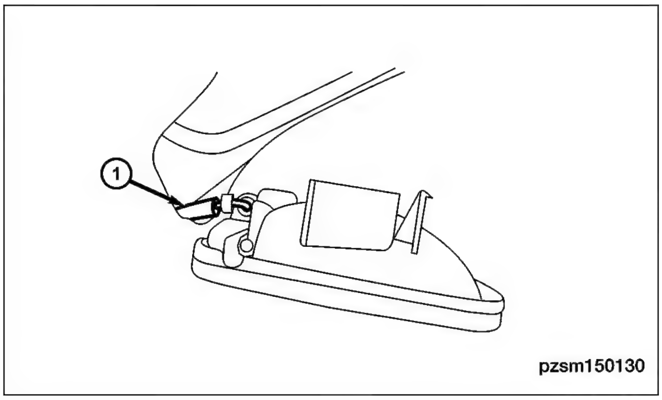
7. Remove the inside door handle retaining screw (1).


1
pzsm150123

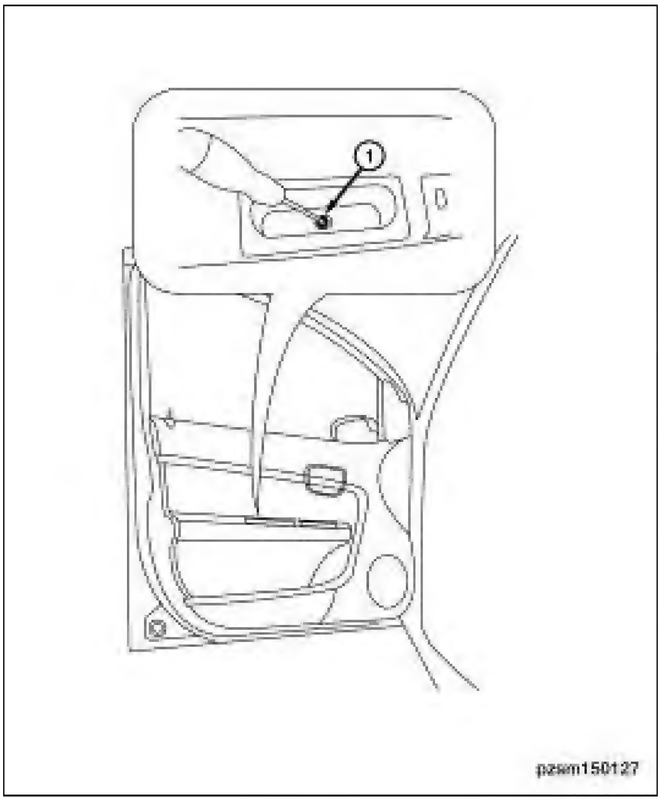
8. Remove the inside door handle (1).


1
pzsm150125

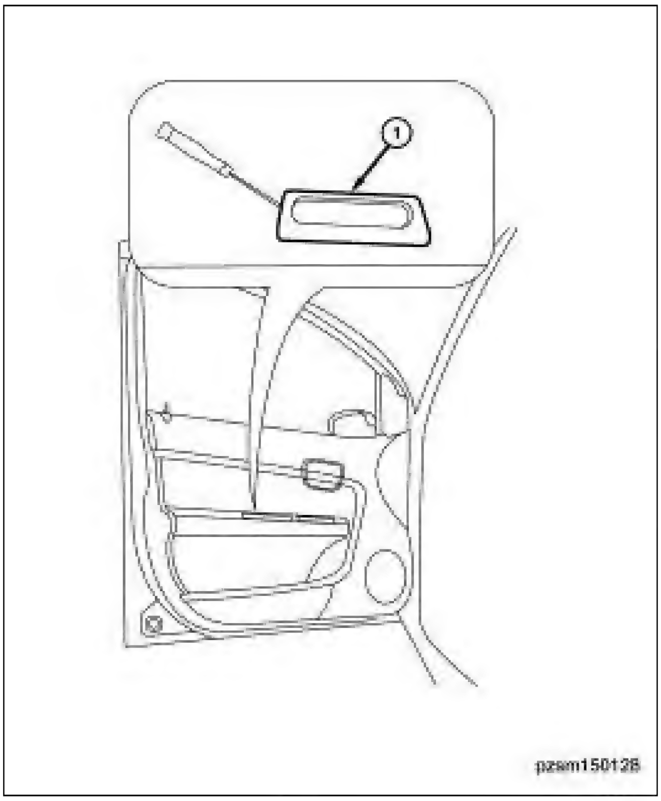
9. Loosen the inside door handle control cable (1).


1
pzsm150130

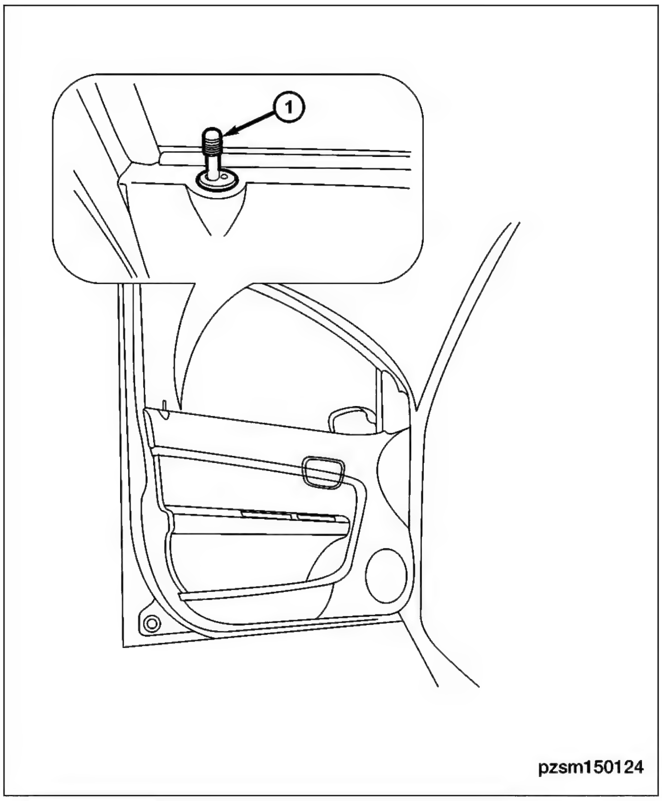
10. Remove the small storage compartment retaining screw (1) on the door trim panel.


1
pzsm150127

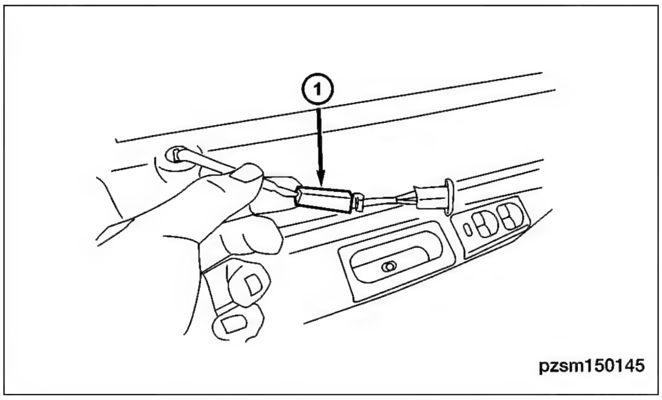
11. Using a trim stick, remove the small storage compartment (1).


1
pzsm150128

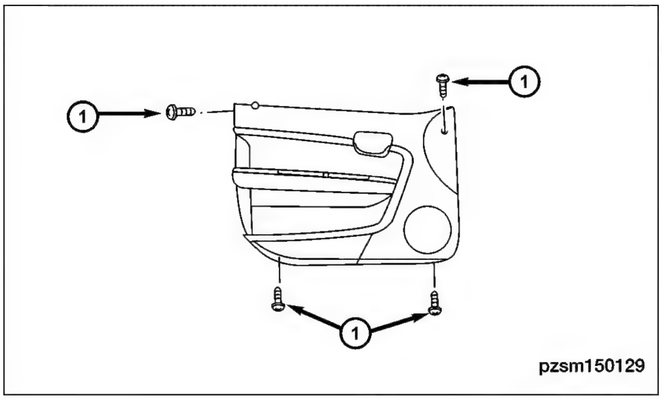
12. Remove the door switch (1).


1
pzsm150124

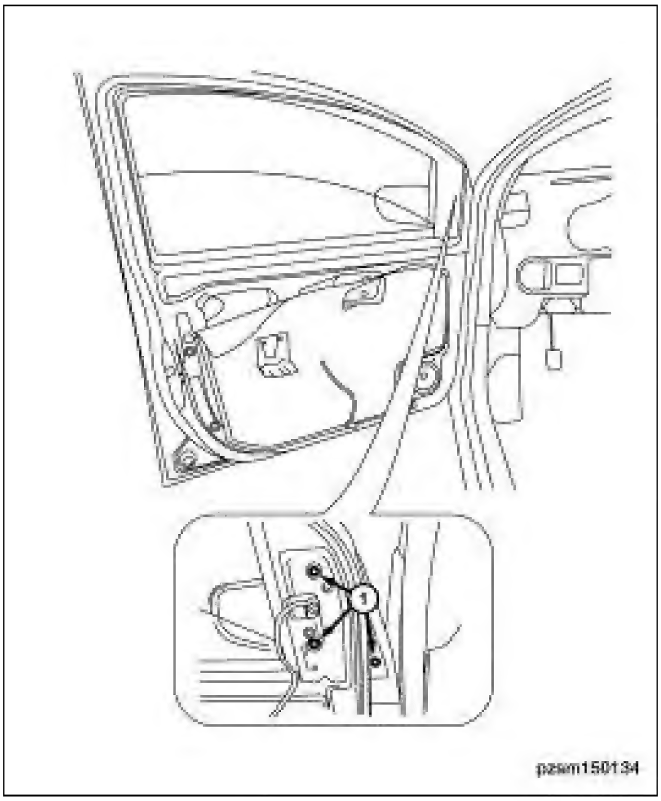
13. Disconnect the door switch electrical connector (1).


1
pzsm150145

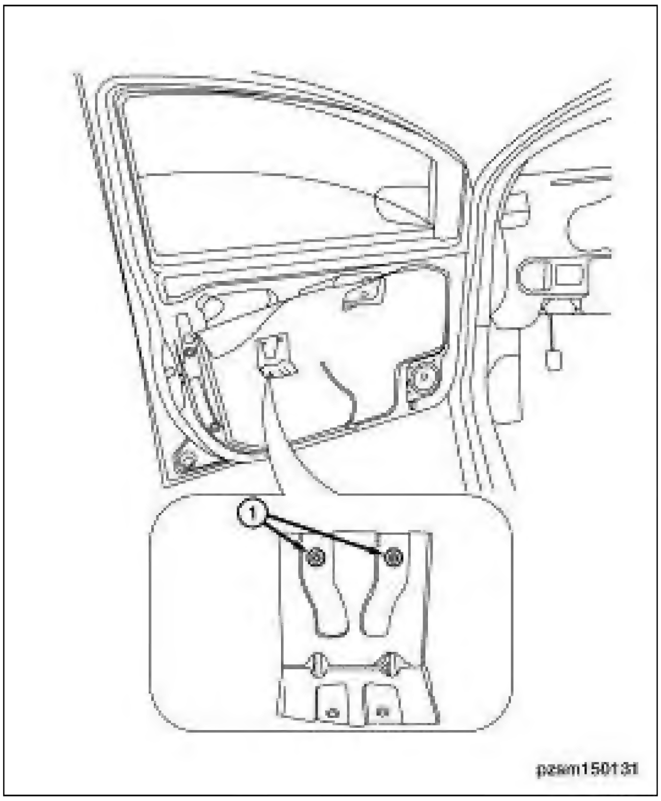
14. Remove the door trim panel four retaining screws (1).
15. Remove the door trim panel.


1
1
1
pzsm150129

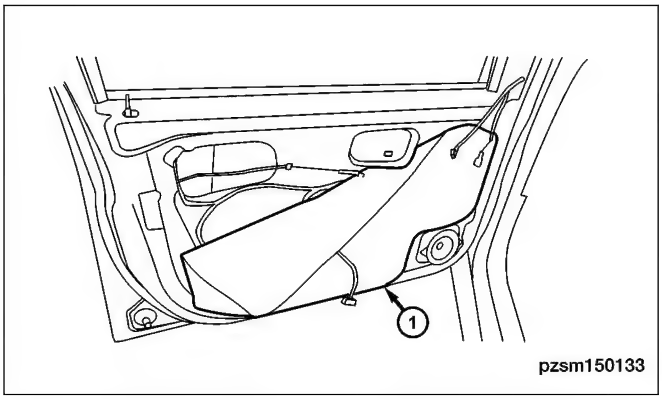
16. Remove the outside mirror retaining nuts (1), and remove the outside mirror electrical connector. (Tighten: Outside mirror retaining nuts to 7 ± 1 N·m)



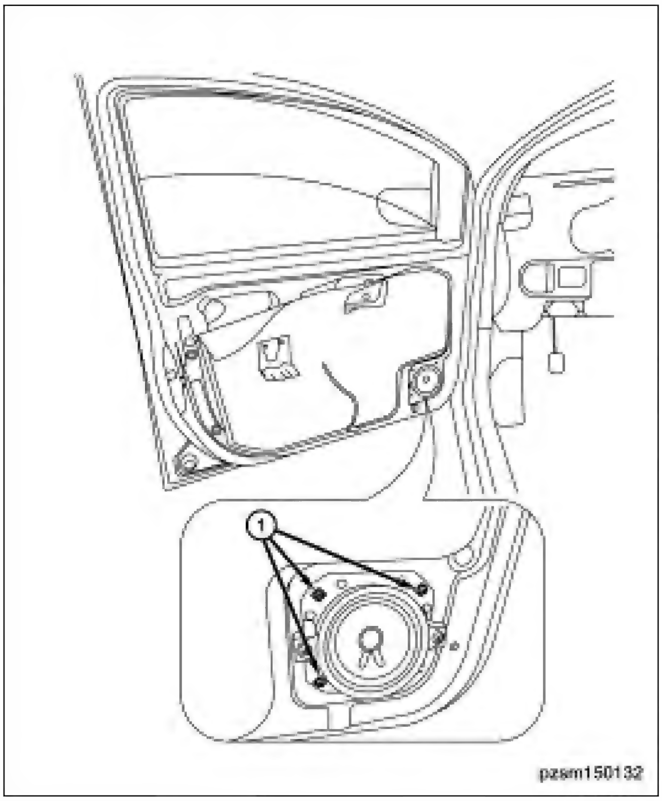
17. Remove the two door trim panel mounting bracket retaining screws (1).



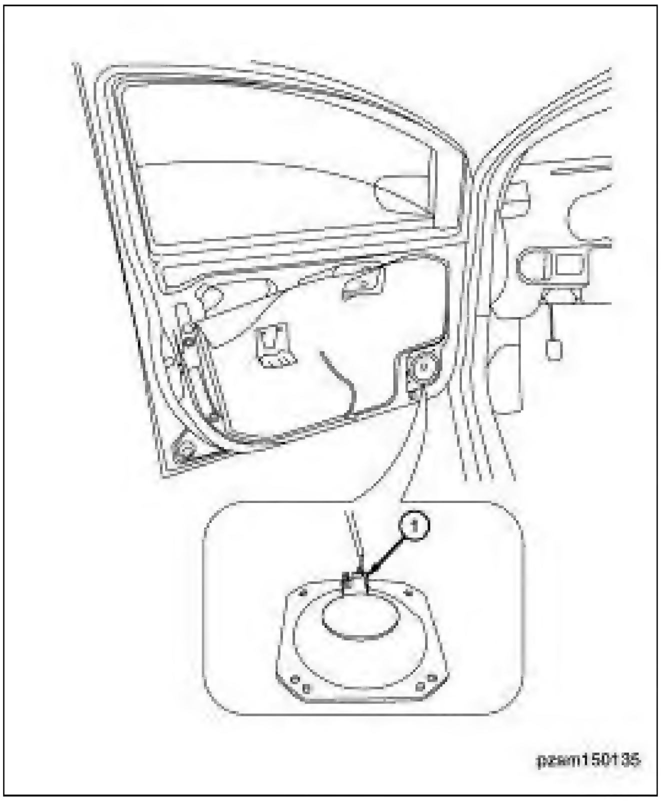
18. Remove the protective film (1) from the front door.


1
pzsm150133

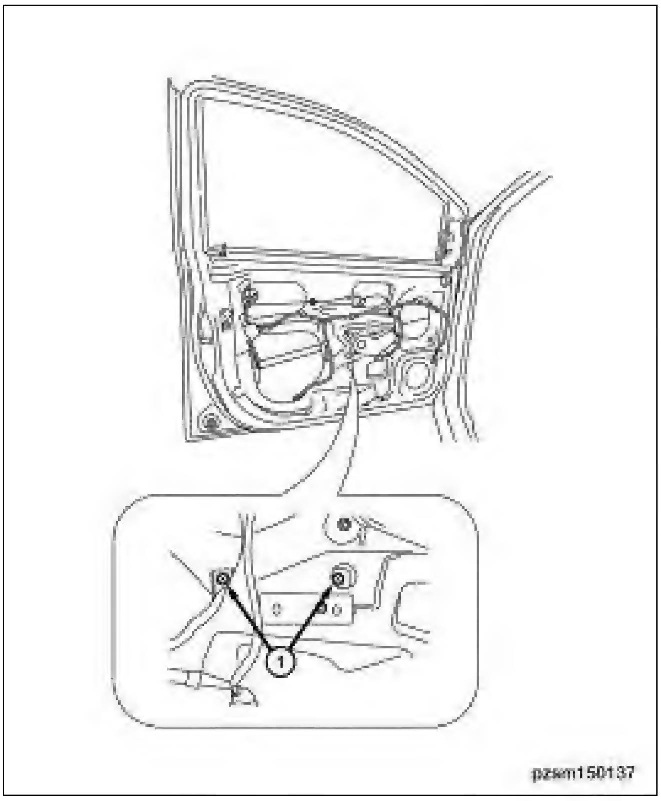
19. Remove the front speaker retaining screws (1).


1
pzsm150132

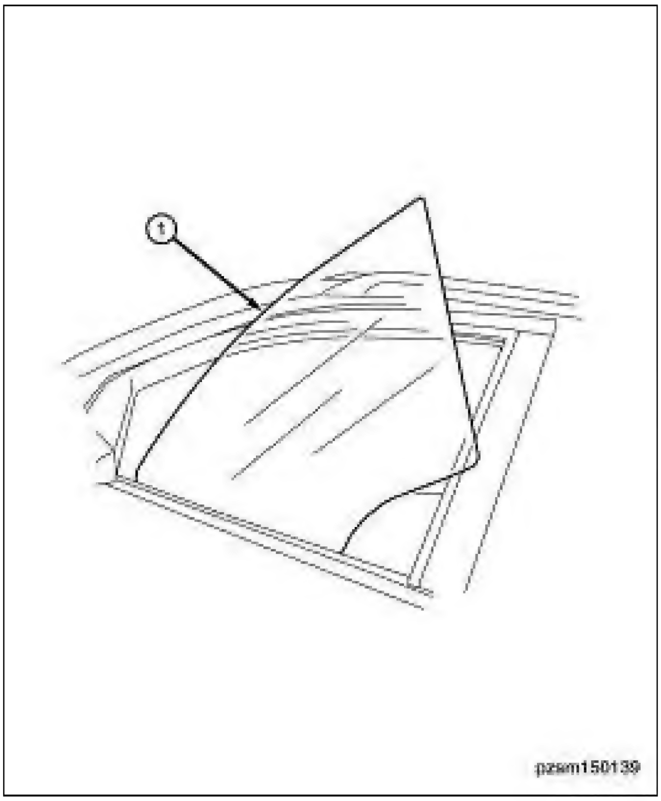
20. Disconnect the speaker electrical connector (1).


1
pzsm150135

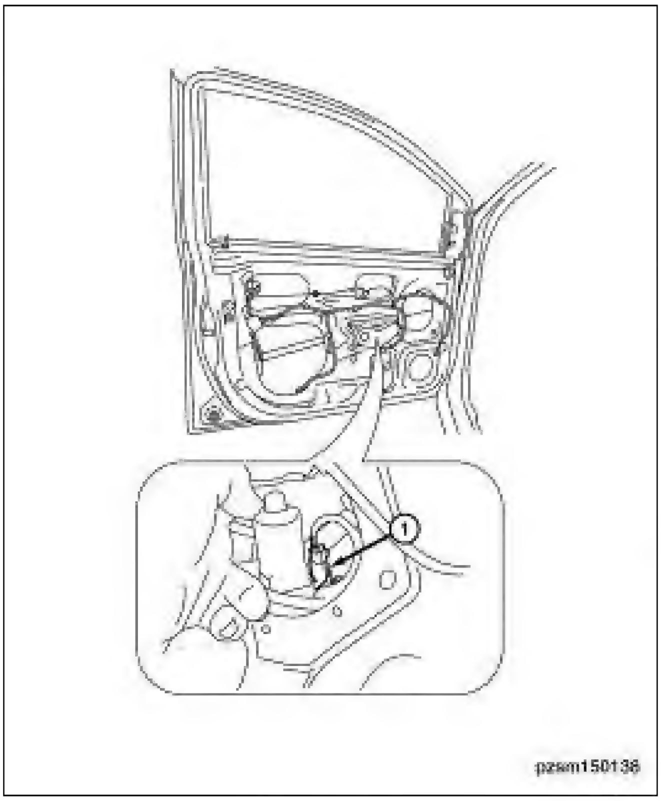
21. Remove the speaker.
22. Lower the door glass to a proper position, remove the two door glass retaining screws (1).


1
pzsm150137

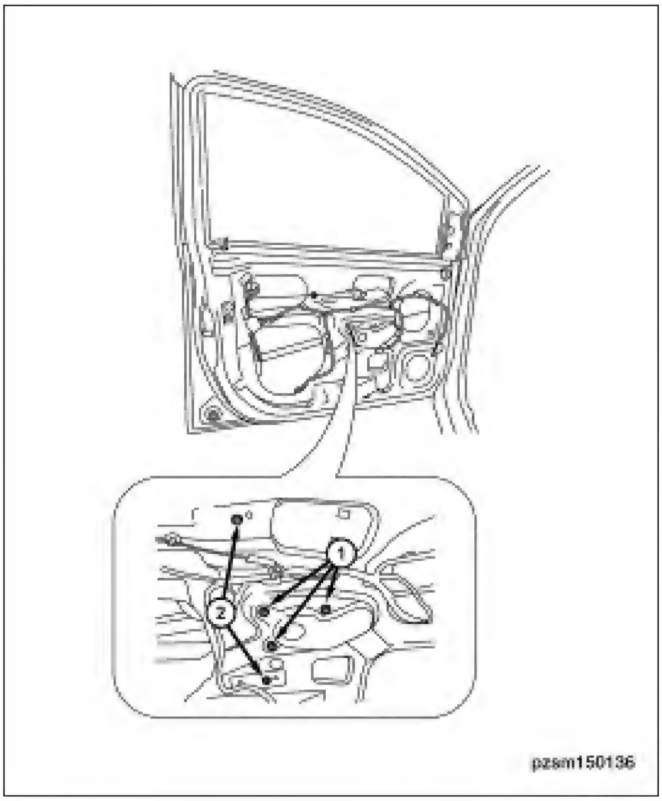
23. Remove the door glass (1).


1
pzsm150139

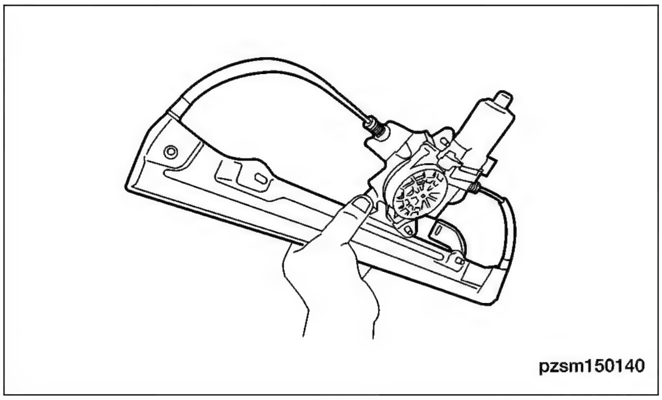
24. Disconnect the window motor electrical connector (1).


1
pzsm150138

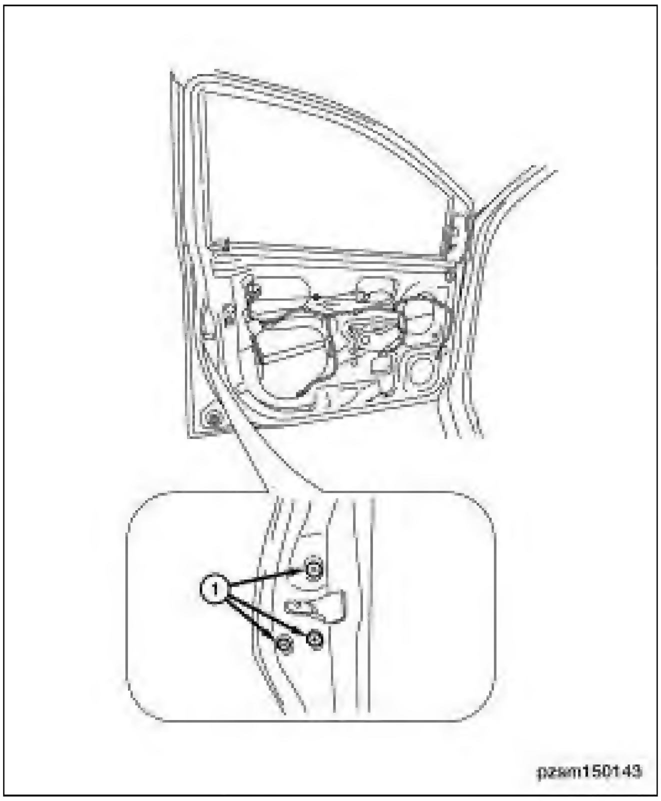
25. Remove the two guide rail mounting nuts (2).
26. Remove the three window regulator retaining nuts (1).
    (Tighten: Window regulator retaining nuts to 9 ± 1 N·m)


1
2
pzsm150136

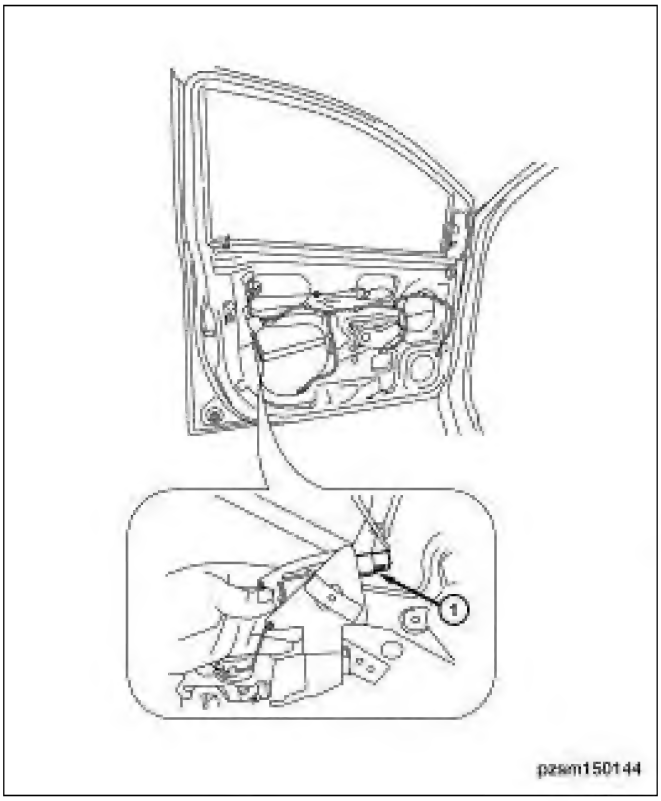
27. Remove the window regulator and guide rail assembly.


pzsm150140

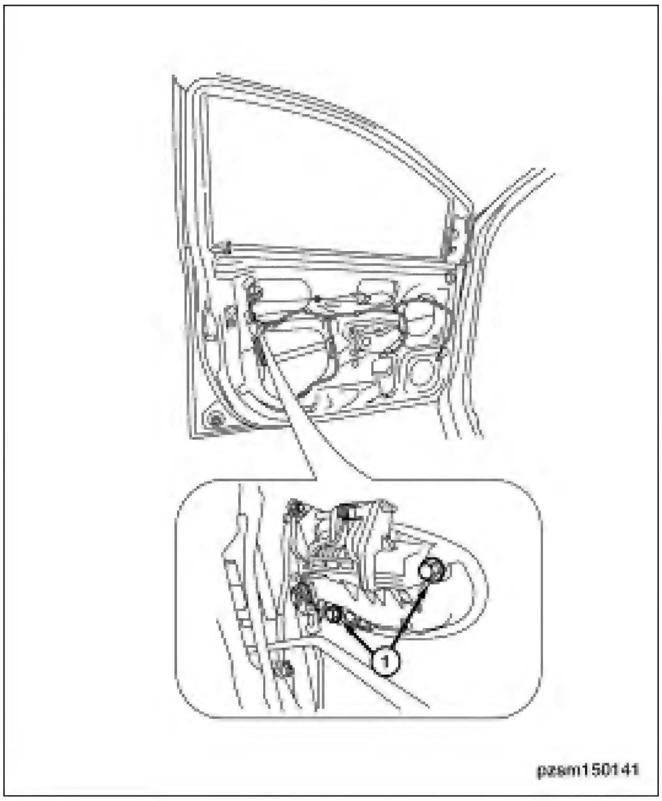
28. Remove the power lock motor retaining bolts (1). (Tighten: Power lock motor retaining bolts to 8 ± 1 N·m)



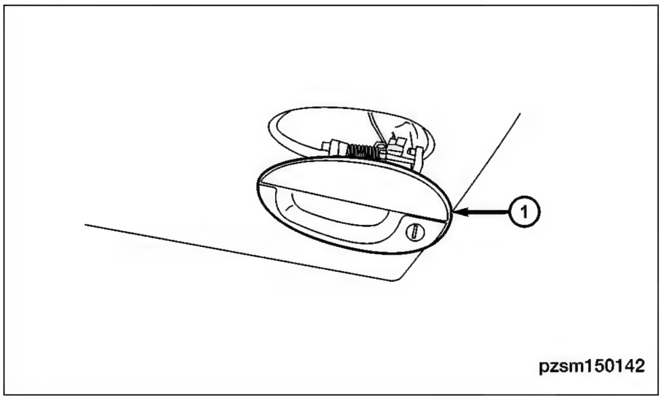
29. Disconnect the power lock motor electrical connector (1).
30. Disconnect the door lock motor connecting rod to the outside door handle.
31. Remove the power door lock motor.



32. Remove the two front outside door handle retaining bolts (1).
    (Tighten: Front outside door handle retaining bolts to 7 ± 1 N·m)
33. Remove the power door lock motor connectors and tie rods.



34. Remove the front outside door handle (1).



Assembly

1. Assembly is in the reverse order of disassembly.

Power Window Assembly Inspection

1. After installing the power window assembly, it should be checked. The time for the glass to travel from the lowest position to the highest position should be about 7 seconds. If the time is too long, recheck the operation of the power window assembly.
2. Check the power window motor working condition.
3. Check the window channel for any abrasive debris that could effect the window operation.
4. Check the window regulator and guide rails for any condition that could effect window operation.

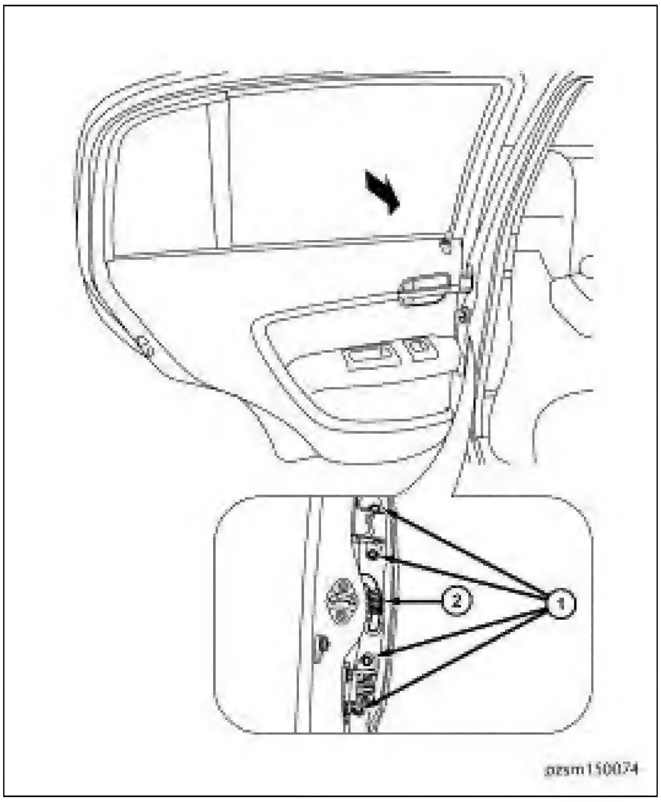
Replacing Front Door Hinge

1. Remove the front fender to gain access to the door hinge (See Fender Removal & Installation in Section 15 Body & Accessories).
2. Support the door.
3. Remove the retaining bolts from the upper and lower hinges and then remove the hinges.

Rear Door

Removal & Installation

1. Turn the ignition switch off.
2. Disconnect the inner electrical harness connector (2) on the rear door.
3. Remove the four rear door mounting bolts (1). (Tighten: Rear door mounting bolts to 36 ± 4 N·m)



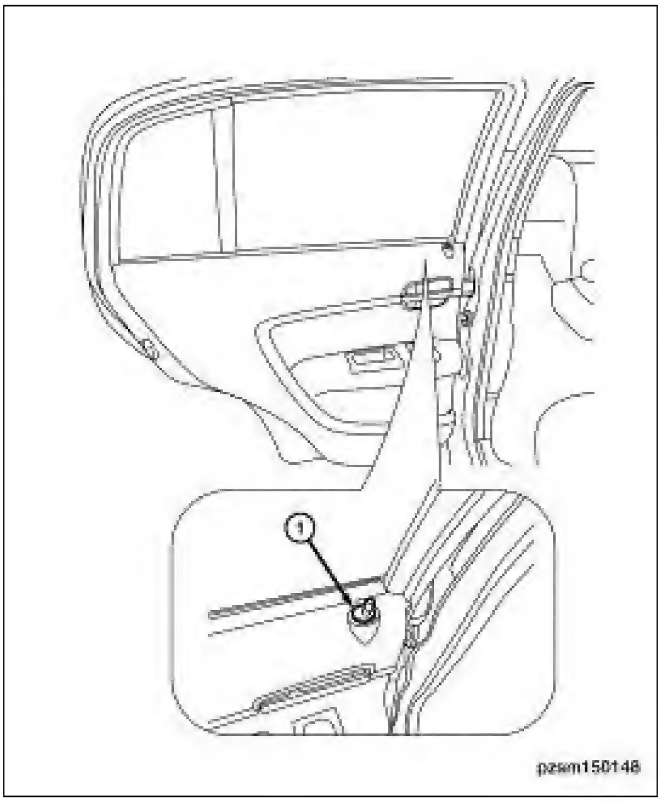
4. Installation is in the reverse order of removal.

Installation Notes:

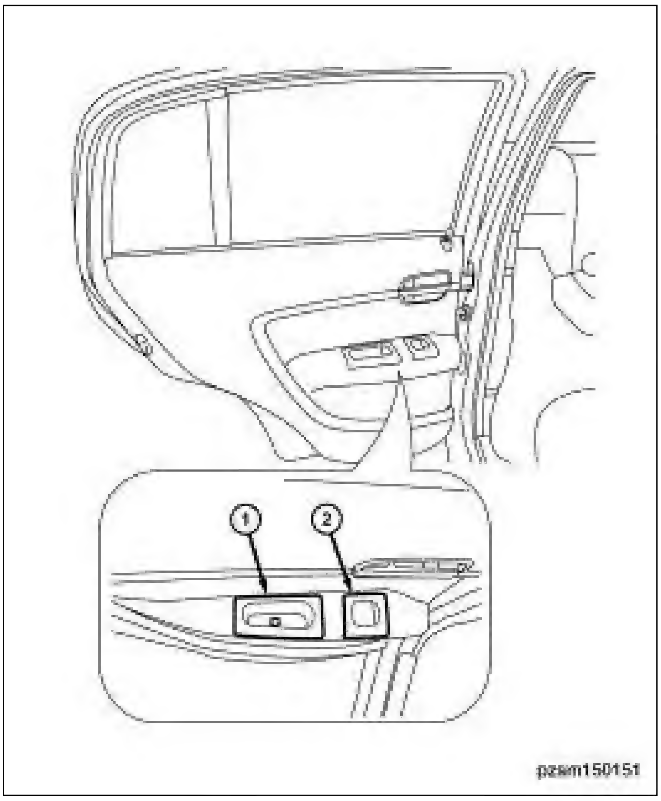
- Adjust the door in the left, right and vertical directions.

Disassembly

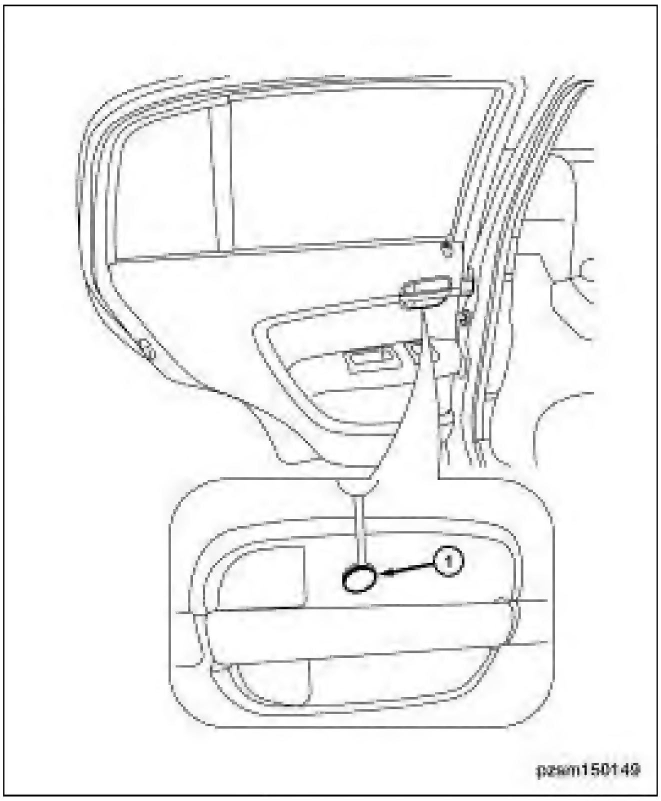
1. Using a trim stick, remove the door lock switch (1).



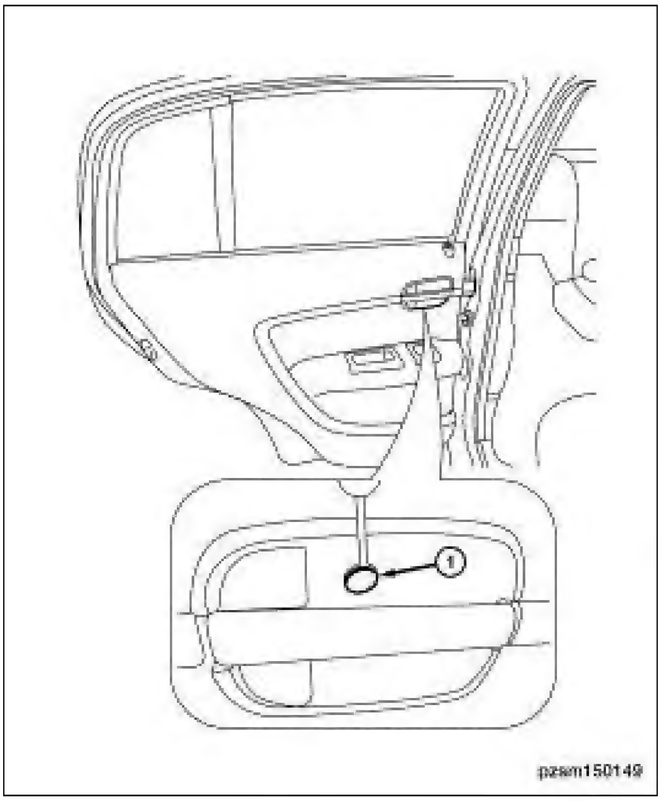
2. Remove the power window switch (2) and disconnect the electrical connector.
3. Remove the small storage compartment (1) retaining screw on the door trim panel and remove the small storage compartment.



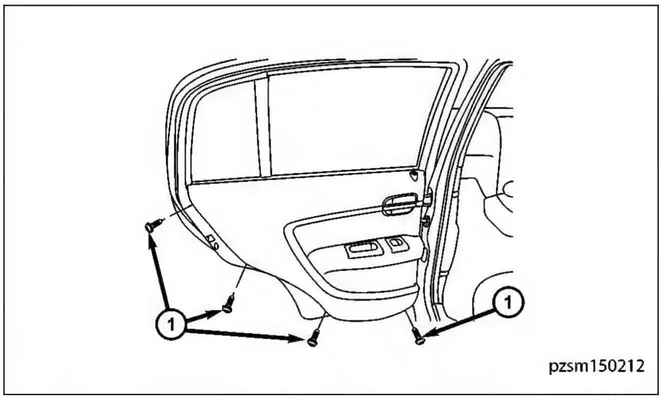
4. Remove the inner door handle panel retaining screw cover (1).


1
pzsm150149

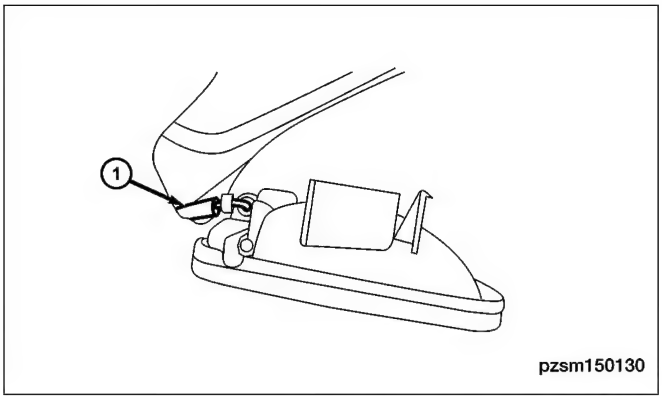
5. Remove the inner door handle retaining screw (1).


1
pzsm150149

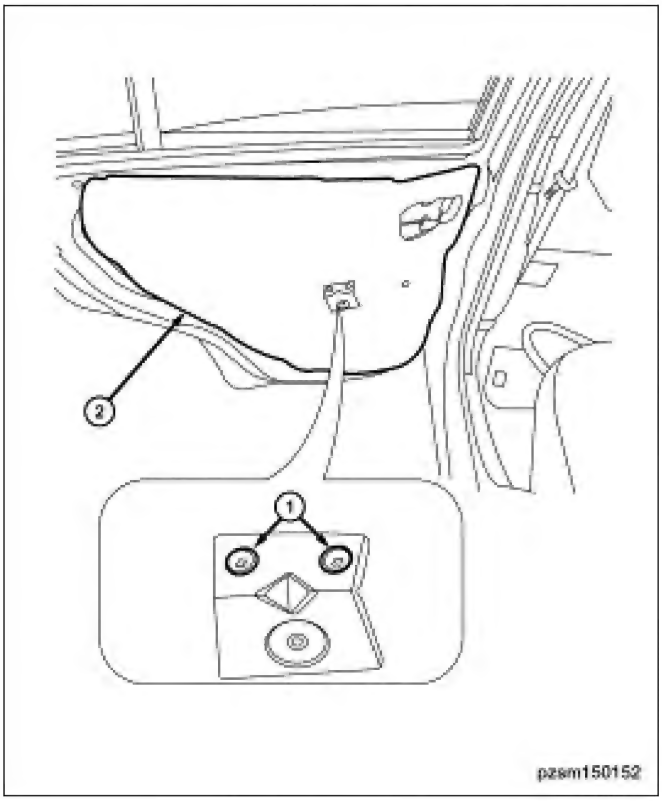
6. Remove the rear door trim panel retaining screws (1).



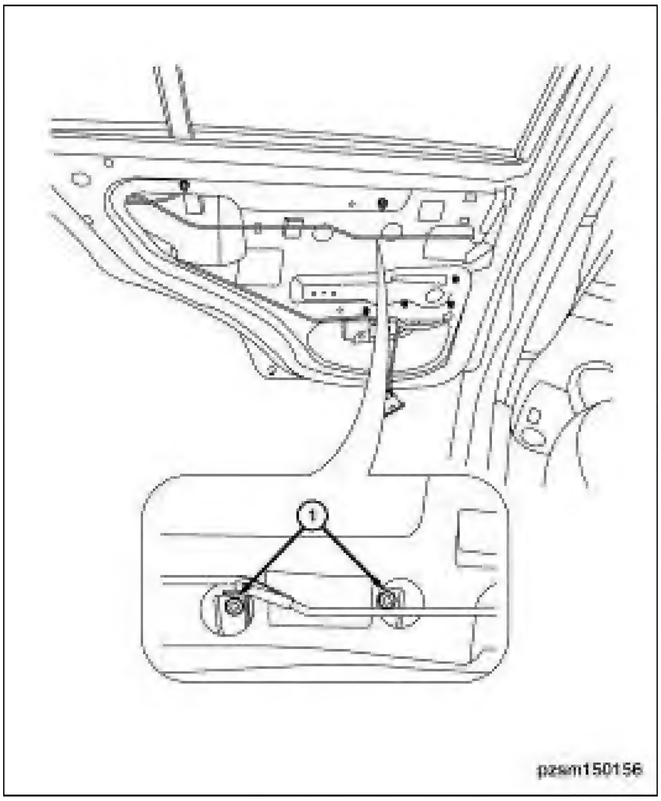
7. Loosen the inside door handle control cable (1) and then remove the inner door handle.



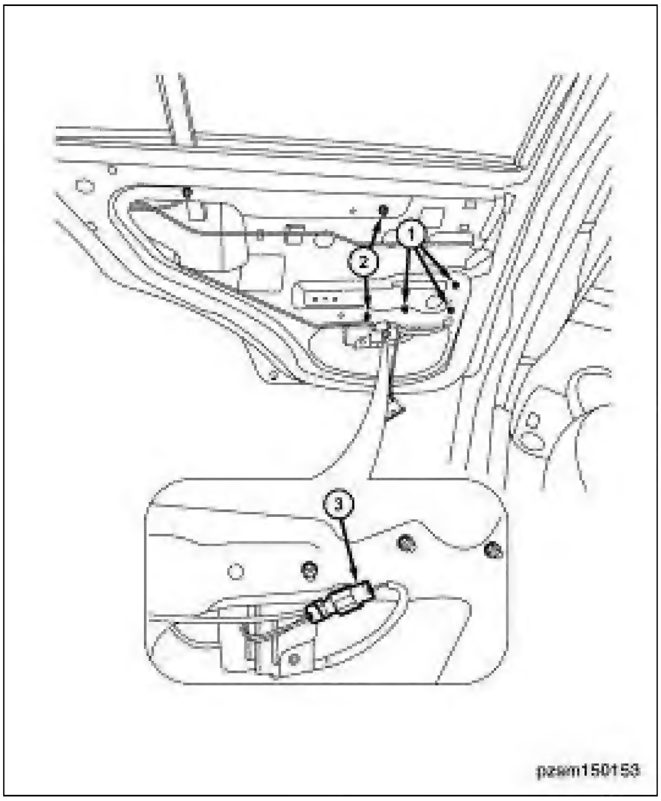
8. Remove the door trim panel.
   CAUTION: While servicing the door panels, care should be taken to maintain a clean work environment.
9. Remove the two door mounting bracket retaining screws (1) and remove the bracket.
10. Remove the protective film (2) from the rear door.



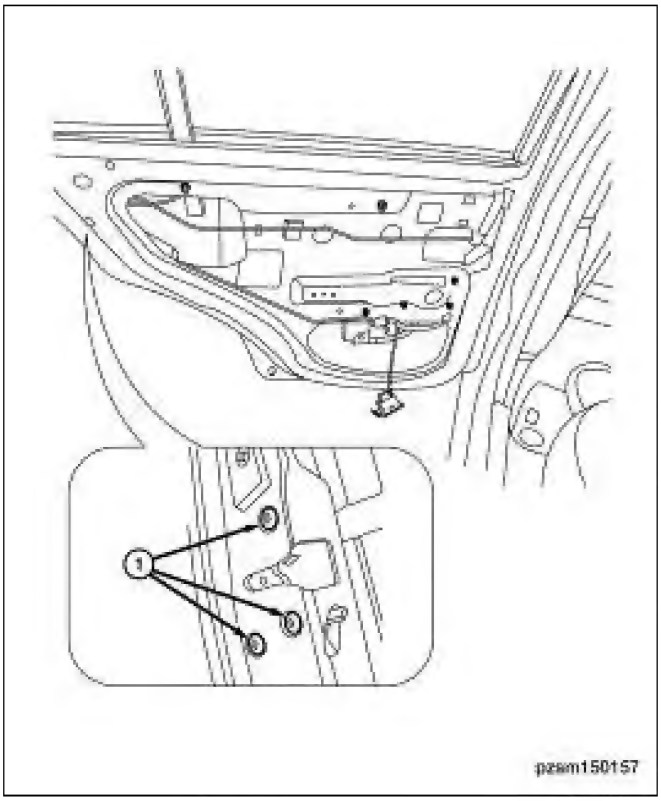
11. Lower the door glass to a proper position, remove the two door glass retaining screws (1).



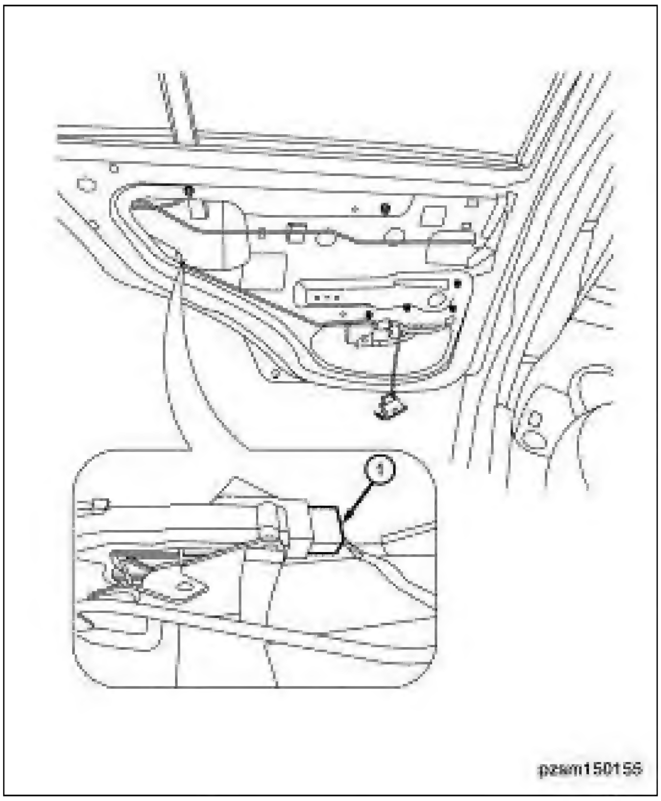
12. Remove the door glass.
13. Disconnect the electrical connector from the window regulator (3).
14. Remove the three window regulator retaining nuts (1).
    (Tighten: Window regulator retaining nuts to 9 ± 1 N·m)
15. Remove the two window guide rail retaining nuts (2).
16. Remove the window regulator and guide rail assembly.



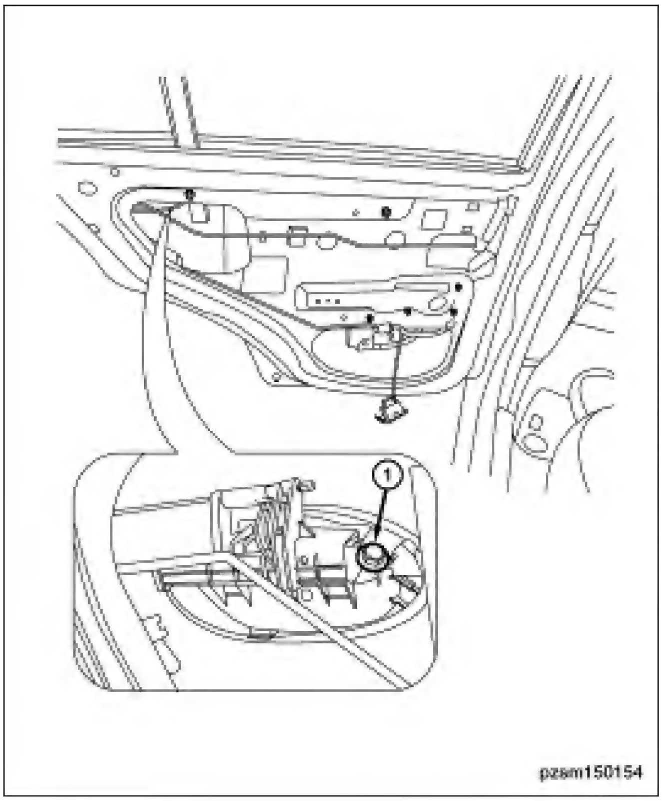
17. Remove the power lock motor retaining screws (1).


1
pzsm150157

18. Disconnect the power lock motor electrical connector (1).
19. Remove the power lock motor.


1
pzsm150155

20. Remove the rear outside door handle retaining bolt (1).
    (Tighten: Rear outside door handle retaining bolt to 7 ± 1 N·m)
21. Remove the power door lock motor connectors and tie rods.
22. Remove the rear outside door handle.



Assembly

1. Assembly is in the reverse order of disassembly.

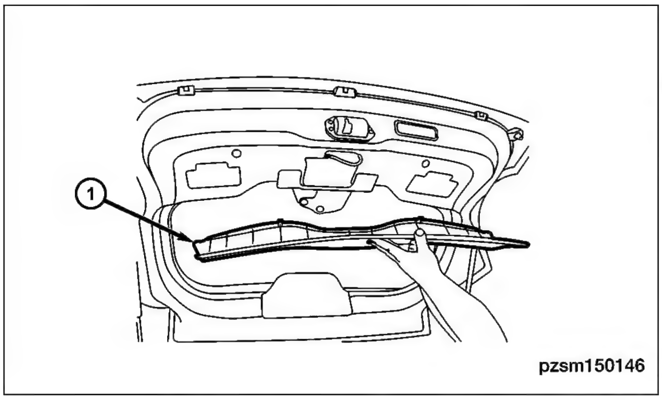
Replacing Rear Door Hinge

1. Remove the door check bolts.
2. Support the door.
3. Remove the retaining bolts from the upper and lower hinges, and then remove the hinges.

Rear Hatch

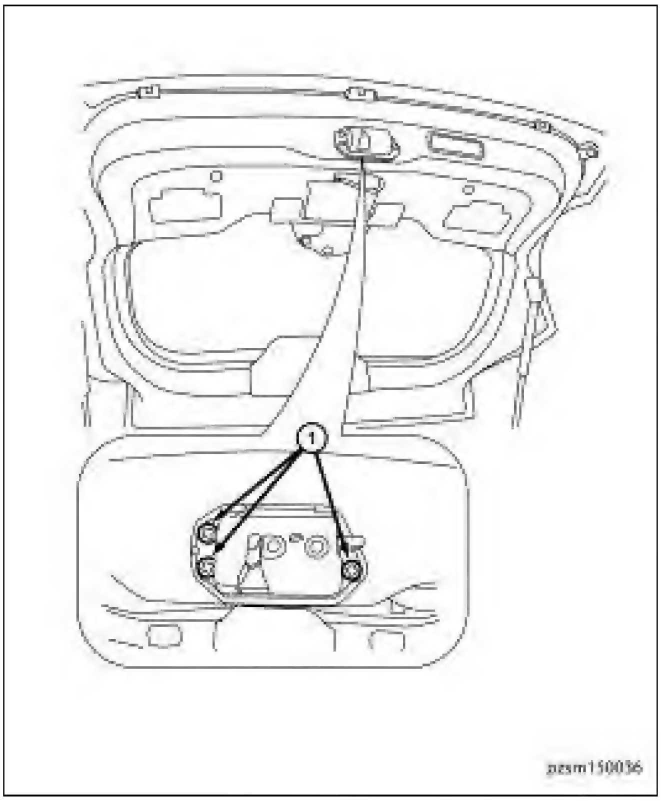
Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the rear hatch trim panel (1).

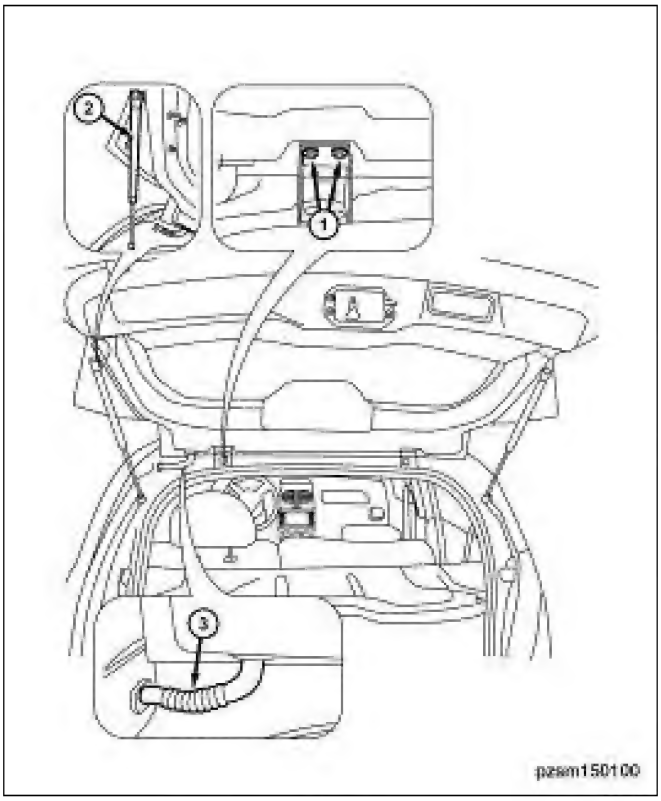


3. Remove the rear wiper motor (See Rear Wiper Motor Removal & Installation in Section 15 Body & Accessories).
4. Remove the high mounted lamp (See High Mounted Stop Lamp Removal & Installation in Section 15 Body & Accessories).

5. Remove the three rear hatch lock retaining screws (1).



6. Remove the rear hatch stay bar (2).
7. Remove the four bolts (1) (two on the left and two on the right) to remove the rear hatch.
   (Tighten: Rear hatch bolts to 20 ± 1 N·m)
8. Disconnect the rear hatch electrical connector (3).



9. Remove the rear hatch.
10. Installation is in the reverse order of removal.

EXTERIOR LAMPS

Description

The exterior lamps consist of the following:
- Headlamps
- Turn Signal Lamps
- Fog Lamps
- Stop Lamps
- Backup Lamp
- Position Lamps

Operation

- Headlamps: With the light switch in the 2nd position, voltage is applied to the Front Fuse and Relay Box. The voltage then energizes the right and left headlamp relays. The relays provide voltage to the headlamps through individual circuits.
- Turn Signal Lamps: When the turn signal switch is in LH or RH position with the ignition switch in the ON position, voltage is applied to the RH or LH turn signal circuit.
- Hazard Lamps: When the hazard switch is in the ON position, voltage is applied to all the turn signal lamps.
- Fog Lamps: When the front/rear fog lamp switch is in the ON position and the light switch is in the 1st or 2nd position, voltage is applied to the fog lamps.
- Stop Lamps: When the brake pedal is applied, the stop lamp switch sends voltage to the stop lamps.
- Backup Lamp: When the transaxle is shifted into reverse, voltage is applied to the backup lamp.

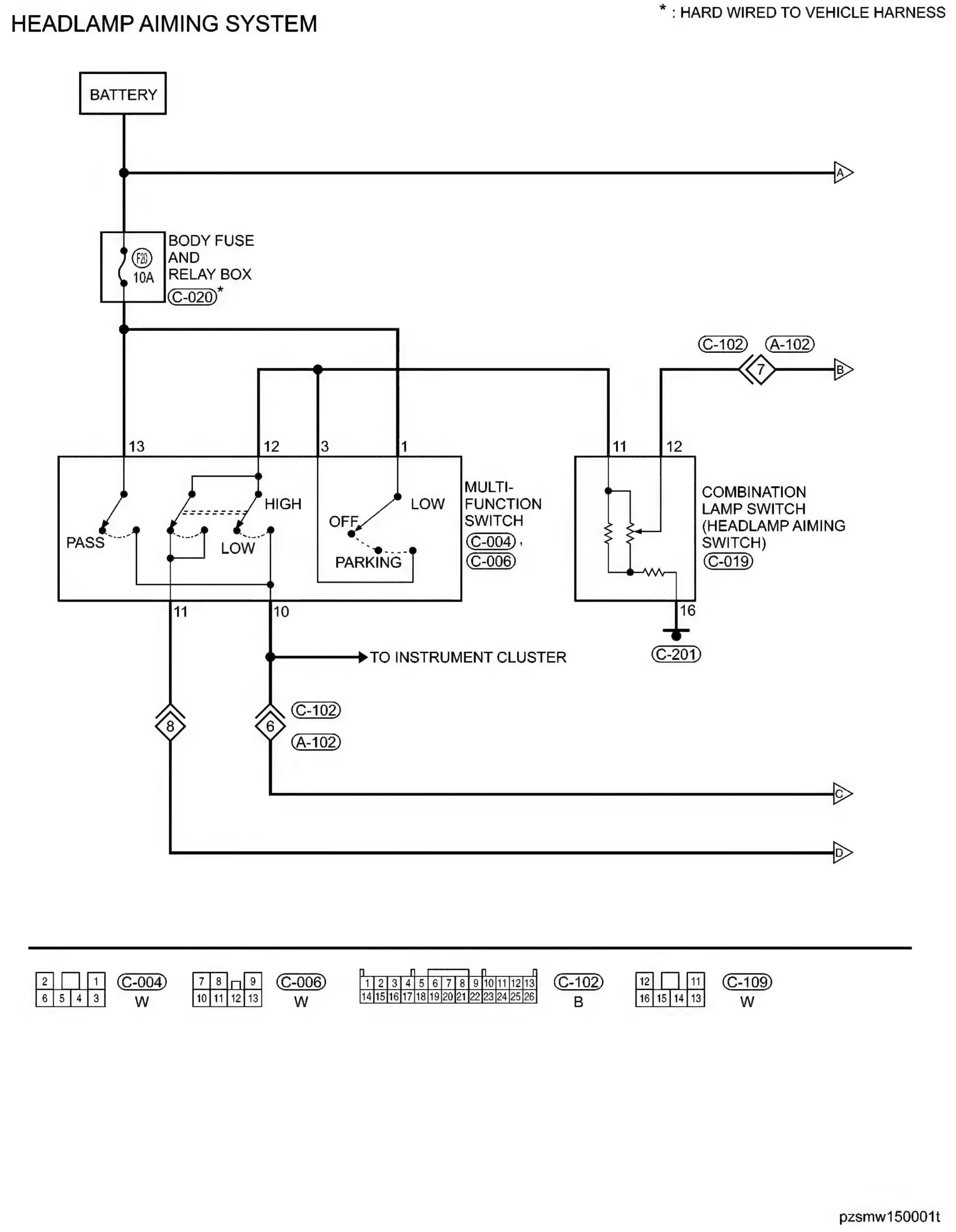
Specification

Torque Specification

DESCRIPTION	TORQUE (N·m)
Front Combination Lamp Retaining Bolt	8 ± 1
Rear Combination Lamp Retaining Screw	8 ± 1

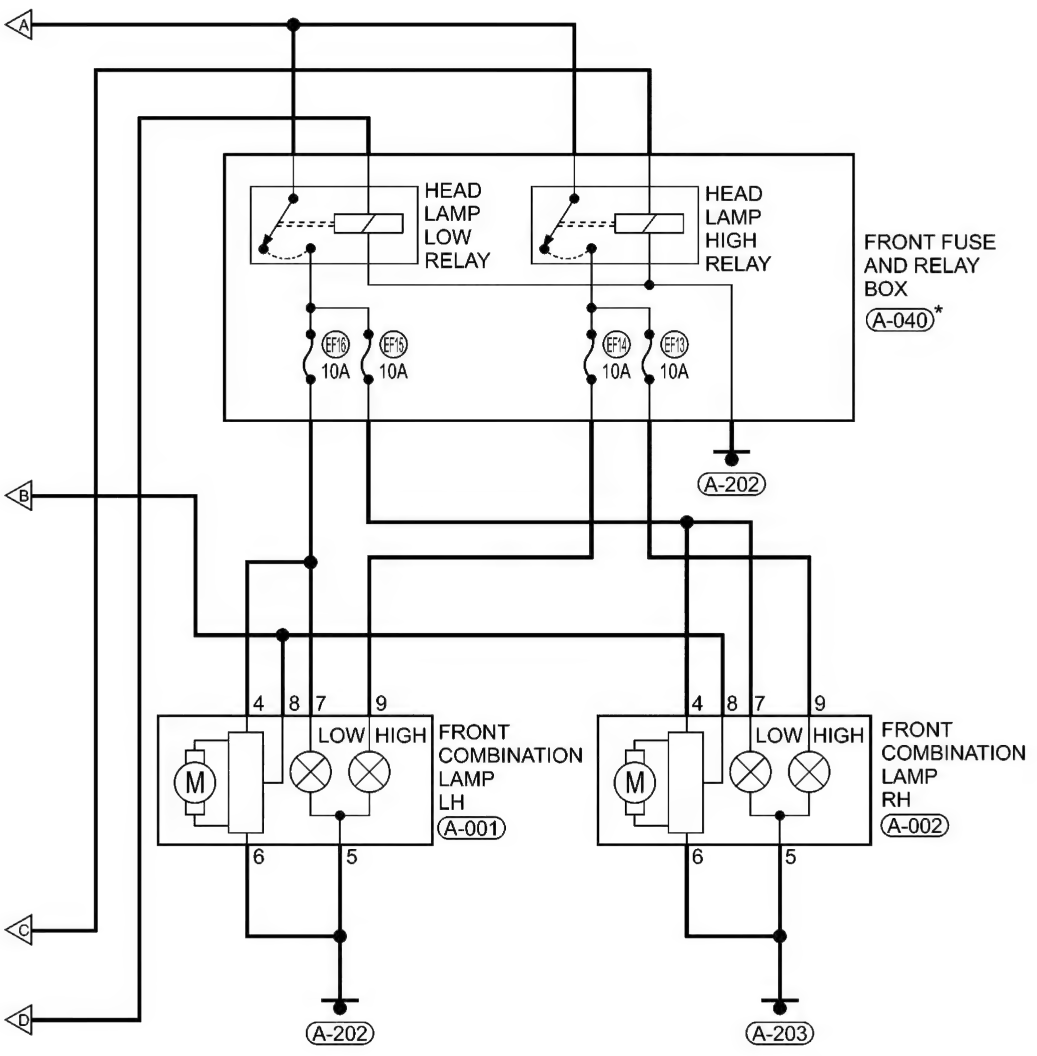
Electrical Schematics

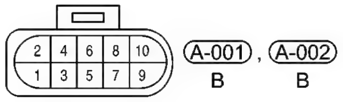
Headlamp System (Page 1 of 2)


HEADLAMP AIMING SYSTEM
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
A
F20
10A
BODY FUSE
AND
RELAY BOX
C-020*
C-102
A-102
7
B
13
12
3
1
11
12
PASS
HIGH
LOW
OFF
LOW
PARKING
MULTI-
FUNCTION
SWITCH
C-004,
C-006
COMBINATION
LAMP SWITCH
(HEADLAMP AIMING
SWITCH)
C-019
11
10
16
TO INSTRUMENT CLUSTER
C-201
8
6
C-102
A-102
C
D
2 1 6 5 4 3
C-004
W
7 8 9 10 11 12 13
C-006
W
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
C-102
B
12 11 16 15 14 13
C-109
W
pzsmw150001t

Headlamp System (Page 2 of 2)

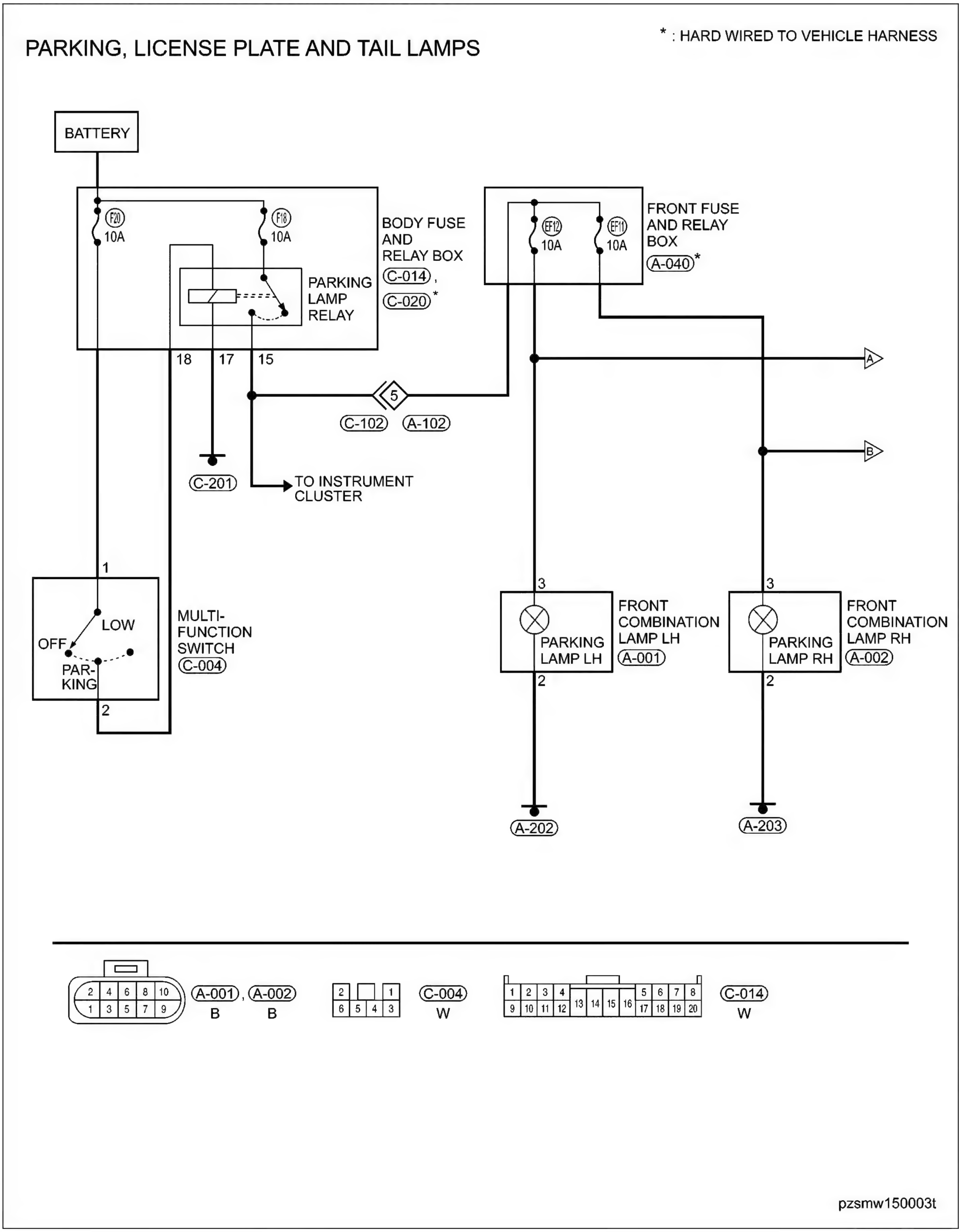
* : HARD WIRED TO VEHICLE HARNESS


A
B
C
D
HEAD LAMP LOW RELAY
HEAD LAMP HIGH RELAY
FRONT FUSE AND RELAY BOX
A-040*
EF16 10A
EF15 10A
EF14 10A
EF13 10A
A-202
4
8
7
9
LOW
HIGH
M
FRONT COMBINATION LAMP LH
A-001
6
5
A-202
4
8
7
9
LOW
HIGH
M
FRONT COMBINATION LAMP RH
A-002
6
5
A-203

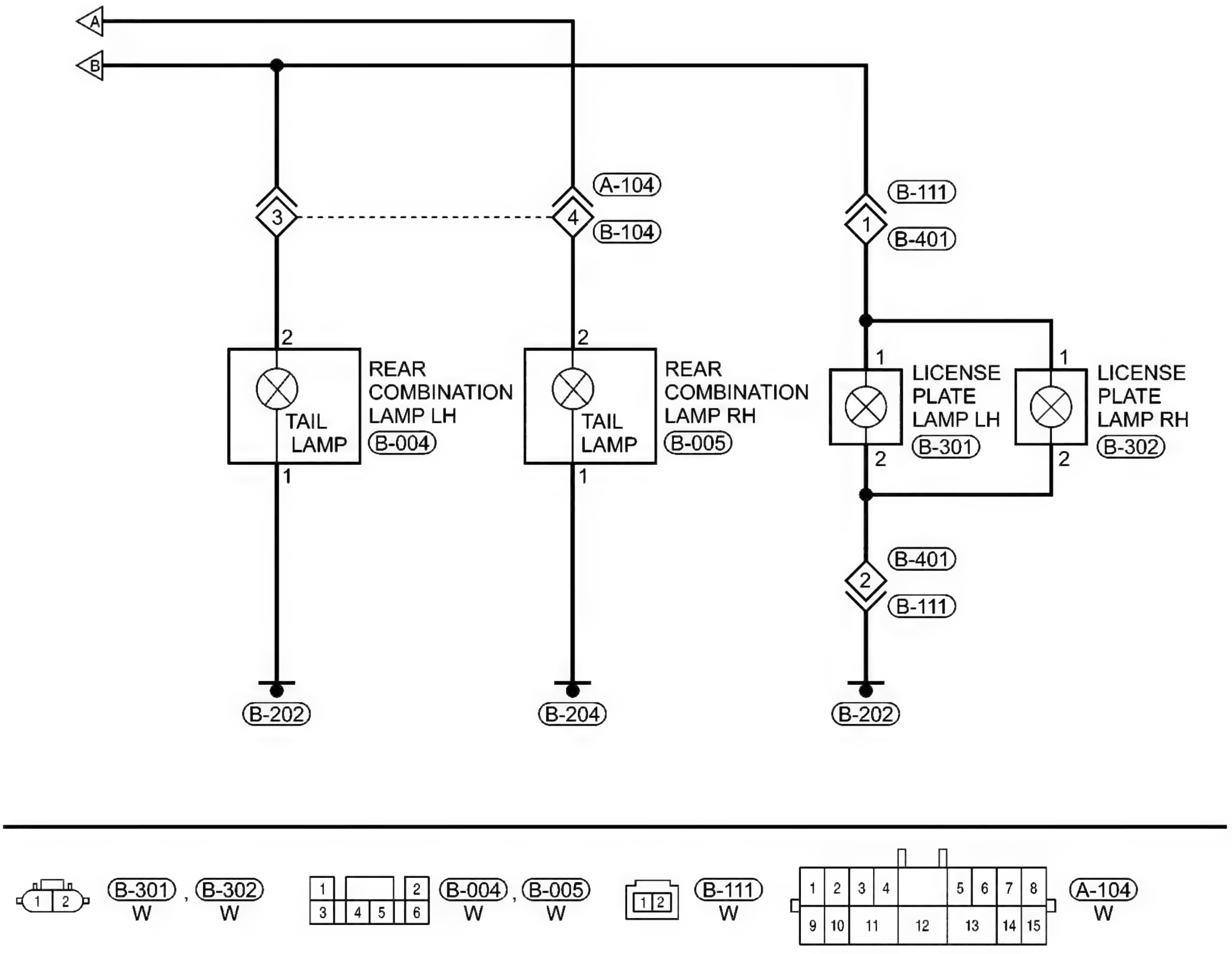

2
4
6
8
10
1
3
5
7
9
A-001 , A-002
B B

pzsmw150002t

Parking, License Plate and Tail Lamps (Page 1 of 2)

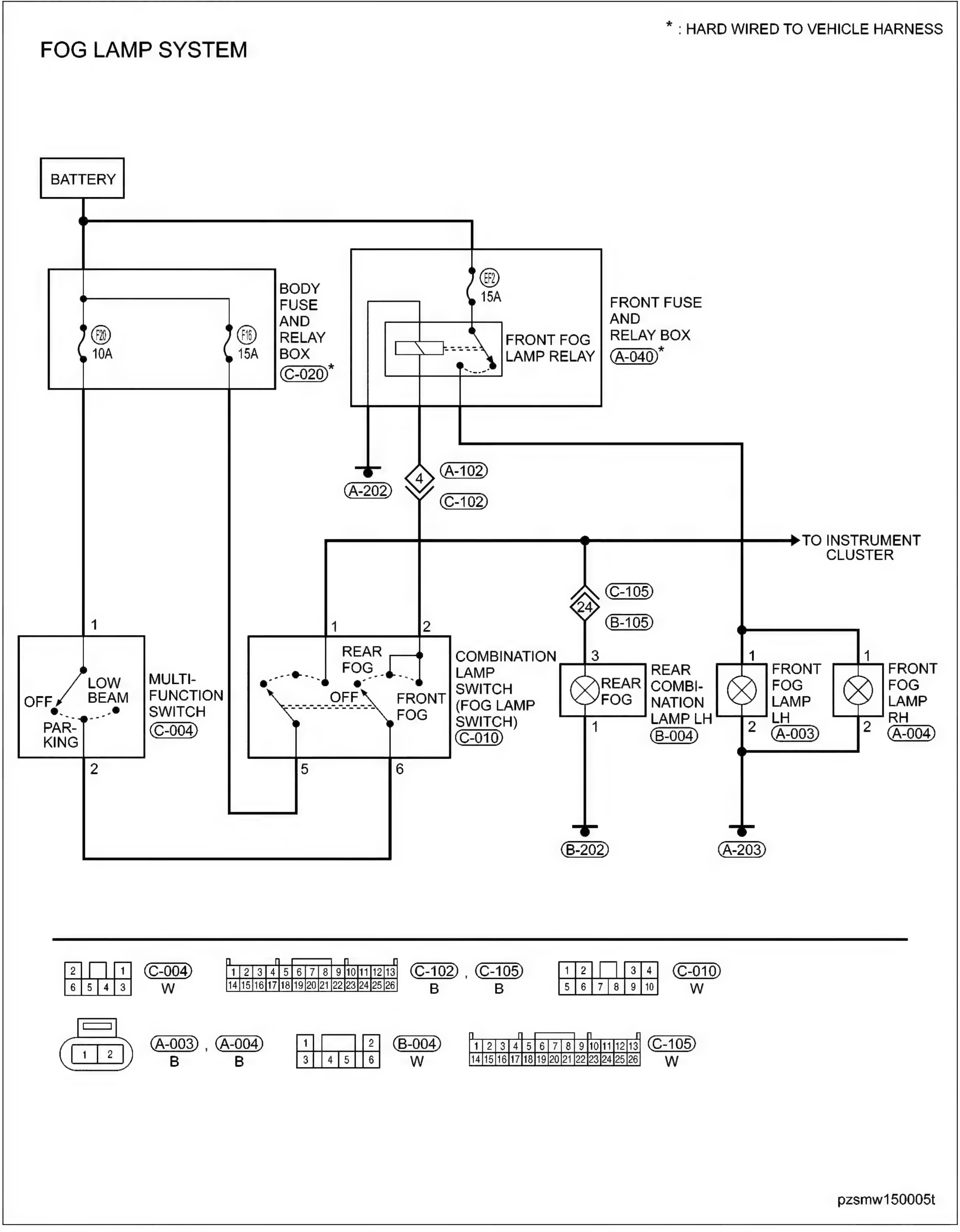

PARKING, LICENSE PLATE AND TAIL LAMPS
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
F20
10A
F18
10A
BODY FUSE AND RELAY BOX
C-014 ,
C-020 *
PARKING LAMP RELAY
18
17
15
EF12
10A
EF11
10A
FRONT FUSE AND RELAY BOX
A-040 *
A
B
5
C-102
A-102
C-201
TO INSTRUMENT CLUSTER
1
LOW
OFF
PAR-KING
2
MULTI-FUNCTION SWITCH
C-004
3
PARKING LAMP LH
2
FRONT COMBINATION LAMP LH
A-001
3
PARKING LAMP RH
2
FRONT COMBINATION LAMP RH
A-002
A-202
A-203
2 4 6 8 10
1 3 5 7 9
A-001 , A-002
B B
2 1
6 5 4 3
C-004
W
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20
C-014
W
pzsmw150003t

Parking, License Plate and Tail Lamps (Page 2 of 2)

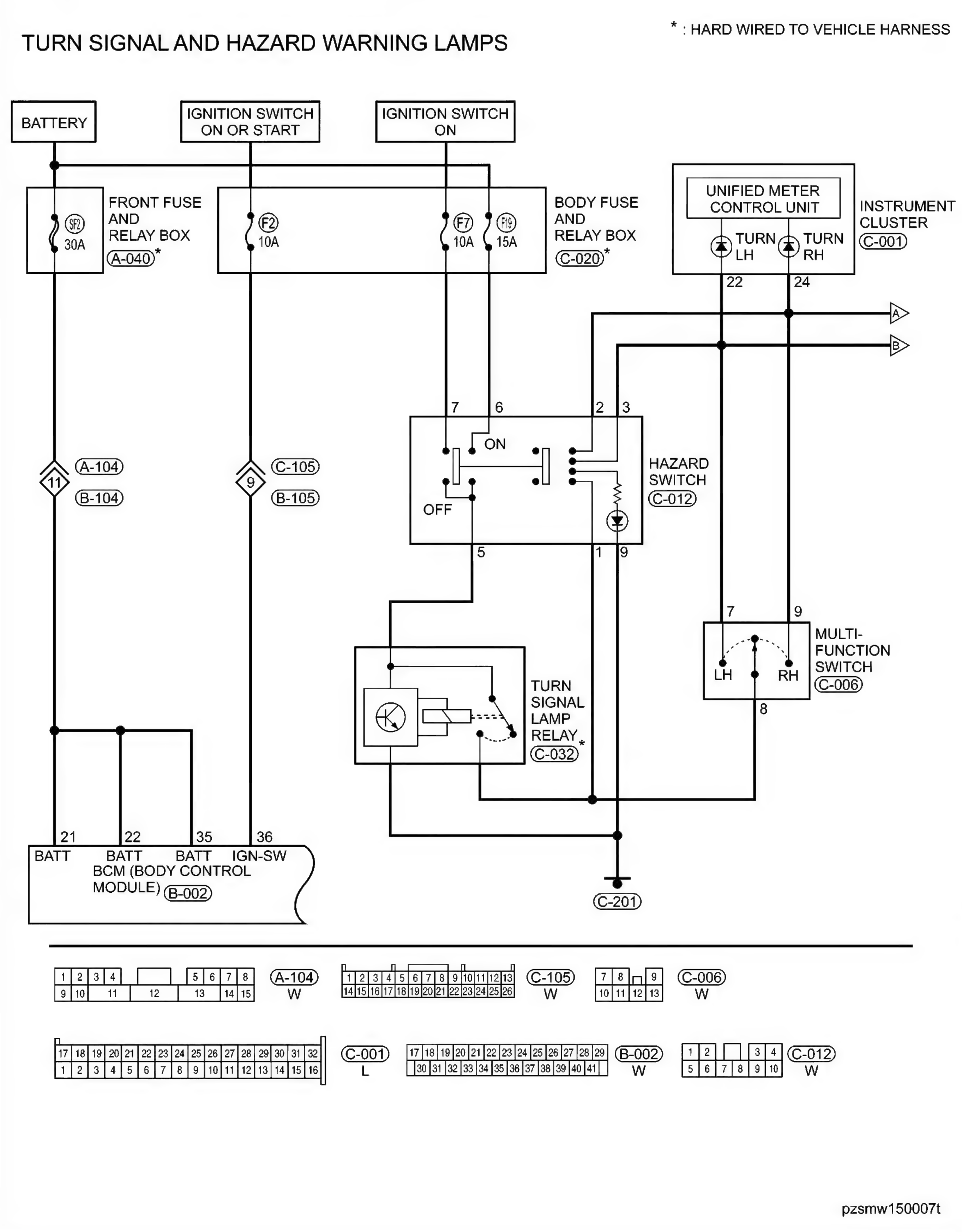

A
B
A-104
B-104
4
3
B-111
B-401
1
2
REAR COMBINATION LAMP LH
B-004
TAIL LAMP
1
2
REAR COMBINATION LAMP RH
B-005
TAIL LAMP
1
LICENSE PLATE LAMP LH
B-301
2
1
LICENSE PLATE LAMP RH
B-302
2
B-401
B-111
B-202
B-204
B-202
B-301, B-302
W
W
B-004, B-005
W
W
B-111
W
A-104
W
1 2
1 2 3 4 5 6
1 2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

pzsmw150004t

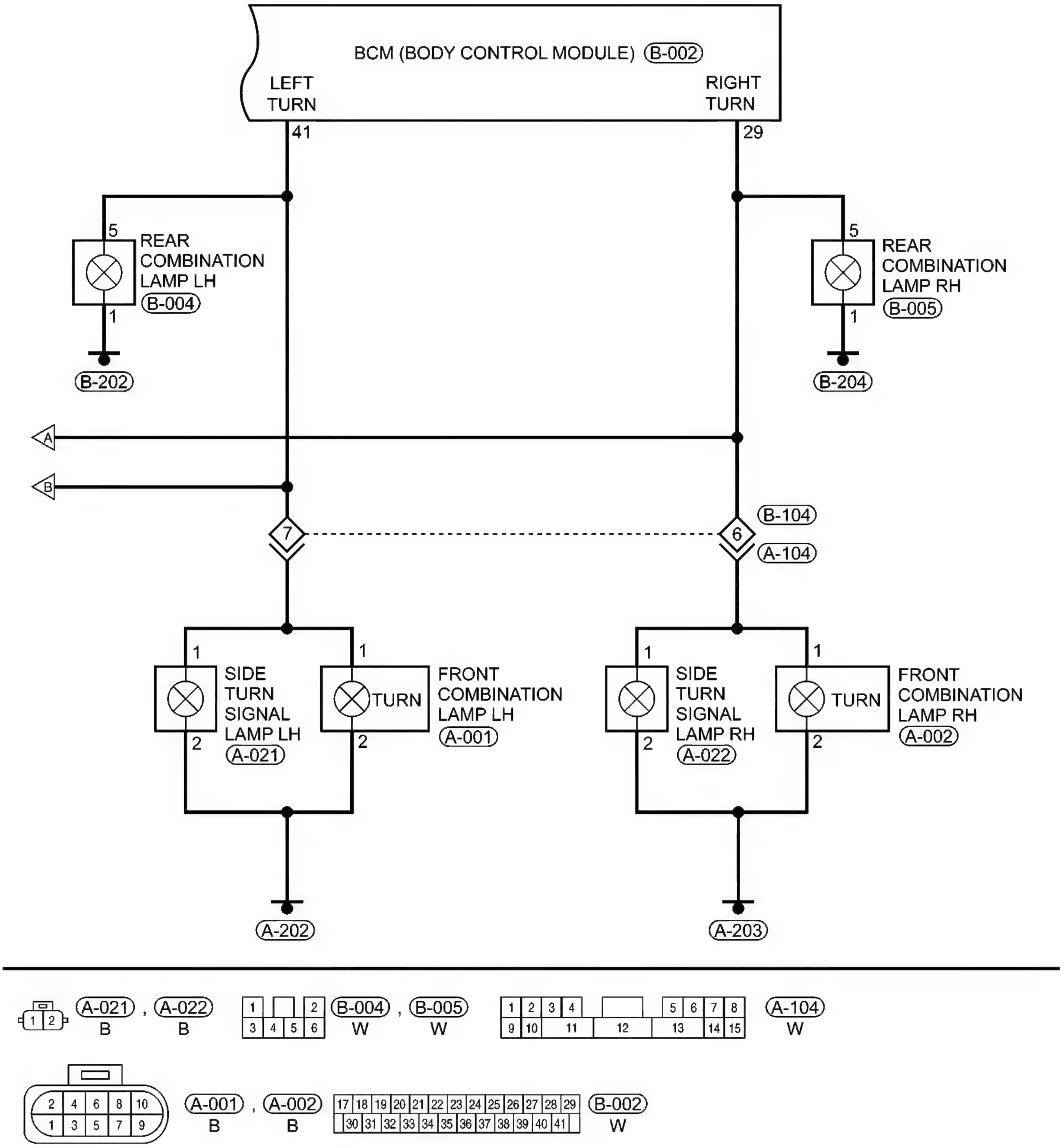
Fog Lamps (Page 1 of 1)


* : HARD WIRED TO VEHICLE HARNESS
FOG LAMP SYSTEM
BATTERY
F20 10A
F16 15A
BODY FUSE AND RELAY BOX
C-020*
EF2 15A
FRONT FOG LAMP RELAY
FRONT FUSE AND RELAY BOX
A-040*
A-202
4
A-102
C-102
TO INSTRUMENT CLUSTER
C-105
24
B-105
1
LOW BEAM
OFF
PAR-KING
2
MULTI-FUNCTION SWITCH
C-004
1
2
REAR FOG
OFF
FRONT FOG
5
6
COMBINATION LAMP SWITCH (FOG LAMP SWITCH)
C-010
3
REAR FOG
1
REAR COMBI-NATION LAMP LH
B-004
1
FRONT FOG LAMP LH
2
A-003
1
FRONT FOG LAMP RH
2
A-004
B-202
A-203
C-004 W
C-102, C-105 B B
C-010 W
A-003, A-004 B B
B-004 W
C-105 W
pzsmw150005t

Turn Signal and Hazard Warning Lamps (Page 1 of 2)

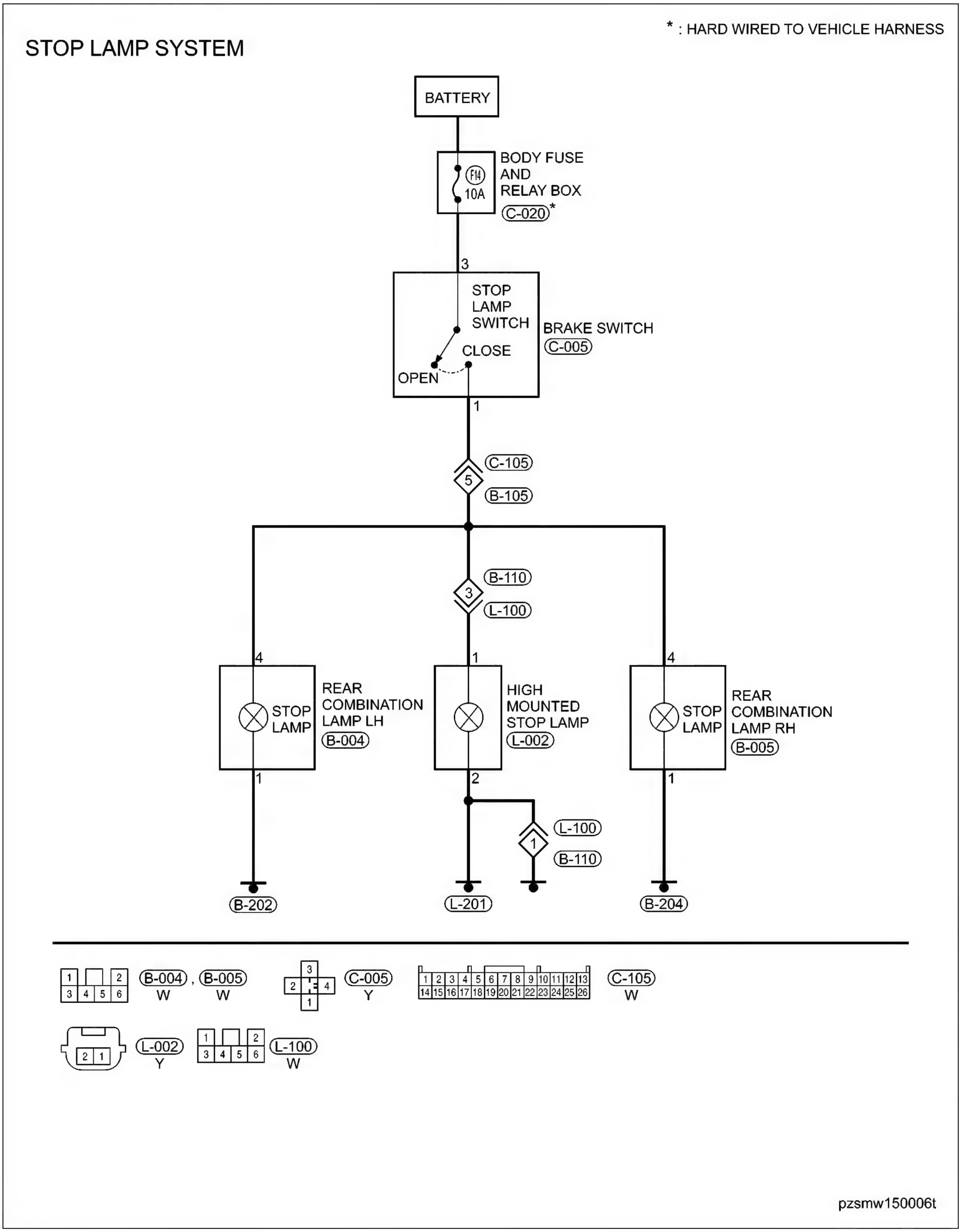

TURN SIGNAL AND HAZARD WARNING LAMPS
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
IGNITION SWITCH ON
FRONT FUSE AND RELAY BOX
A-040*
SF2 30A
F2 10A
F7 10A
F19 15A
BODY FUSE AND RELAY BOX
C-020*
UNIFIED METER CONTROL UNIT
TURN LH
TURN RH
INSTRUMENT CLUSTER
C-001
22
24
A
B
7
6
2
3
ON
OFF
HAZARD SWITCH
C-012
5
1
9
A-104
11
B-104
C-105
9
B-105
MULTI-FUNCTION SWITCH
C-006
7
9
LH
RH
8
TURN SIGNAL LAMP RELAY*
C-032
21
22
35
36
BATT
BATT
BATT
IGN-SW
BCM (BODY CONTROL MODULE)
B-002
C-201
A-104 W
C-105 W
C-006 W
C-001 L
B-002 W
C-012 W
pzsmw150007t

Turn Signal and Hazard Warning Lamps (Page 2 of 2)

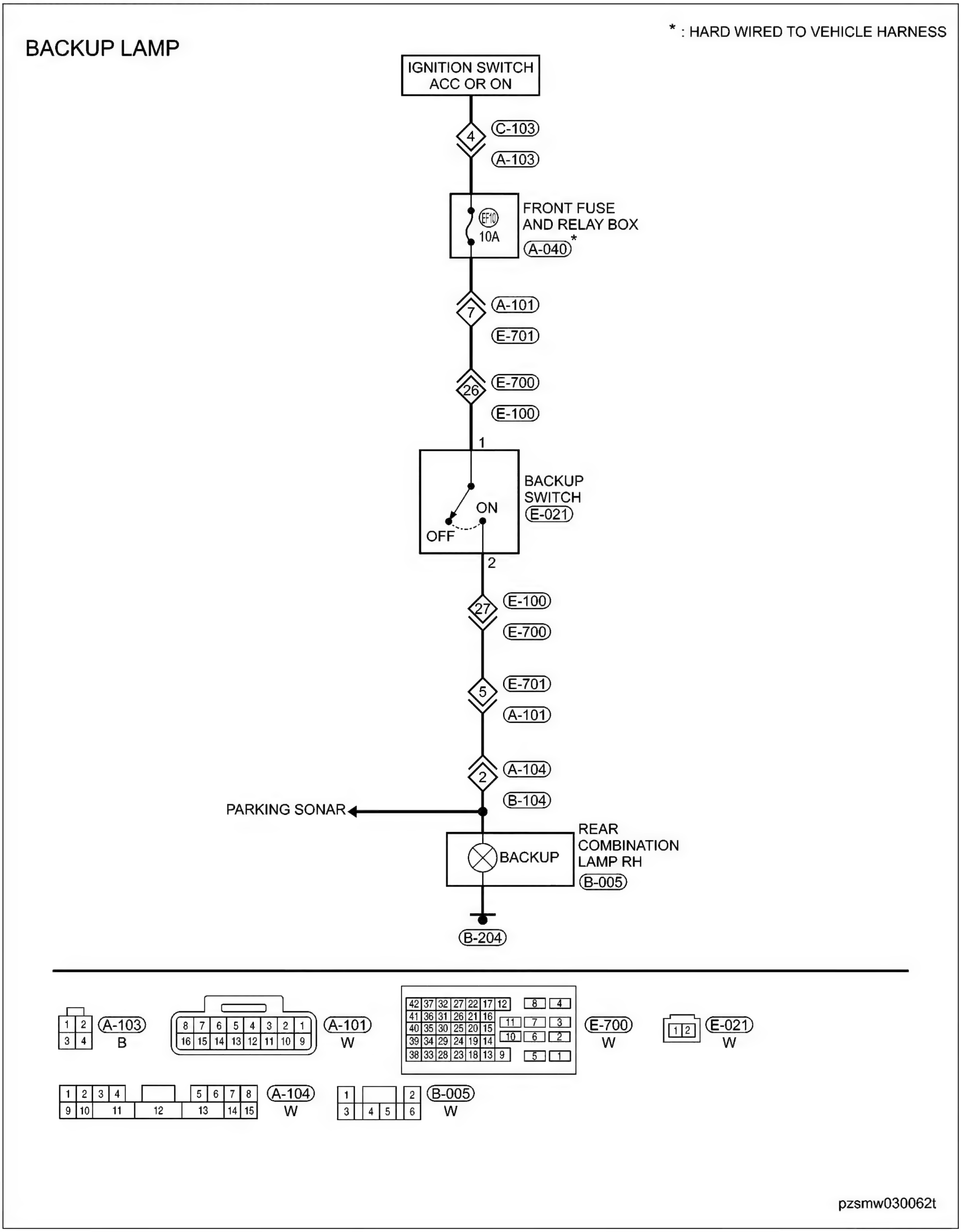

BCM (BODY CONTROL MODULE) B-002
LEFT TURN
RIGHT TURN
41
29
5
REAR COMBINATION LAMP LH
B-004
1
B-202
5
REAR COMBINATION LAMP RH
B-005
1
B-204
A
B
7
6
B-104
A-104
1
SIDE TURN SIGNAL LAMP LH
A-021
2
1
TURN
FRONT COMBINATION LAMP LH
A-001
2
1
SIDE TURN SIGNAL LAMP RH
A-022
2
1
TURN
FRONT COMBINATION LAMP RH
A-002
2
A-202
A-203
A-021, A-022
B B
B-004, B-005
W W
A-104
W
A-001, A-002
B B
B-002
W

pzsmw150008t

Stop Lamp (Page 1 of 1)


* : HARD WIRED TO VEHICLE HARNESS
STOP LAMP SYSTEM
BATTERY
BODY FUSE AND RELAY BOX
F14
10A
C-020*
3
STOP LAMP SWITCH
BRAKE SWITCH
C-005
CLOSE
OPEN
1
C-105
5
B-105
B-110
3
L-100
4
STOP LAMP
REAR COMBINATION LAMP LH
B-004
1
HIGH MOUNTED STOP LAMP
L-002
2
4
STOP LAMP
REAR COMBINATION LAMP RH
B-005
1
L-100
1
B-110
B-202
L-201
B-204
B-004, B-005
W W
C-005
Y
C-105
W
L-002
Y
L-100
W
pzsmw150006t

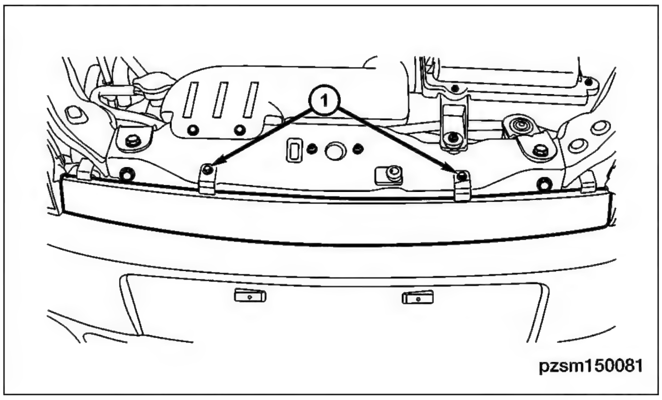
Backup Lamps (Page 1 of 1)


BACKUP LAMP
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ACC OR ON
4
C-103
A-103
EF10
10A
FRONT FUSE AND RELAY BOX
A-040*
7
A-101
E-701
26
E-700
E-100
1
BACKUP SWITCH
E-021
ON
OFF
2
27
E-100
E-700
5
E-701
A-101
2
A-104
B-104
PARKING SONAR
BACKUP
REAR COMBINATION LAMP RH
B-005
B-204
A-103
B
A-101
W
E-700
W
E-021
W
A-104
W
B-005
W
pzsmw030062t

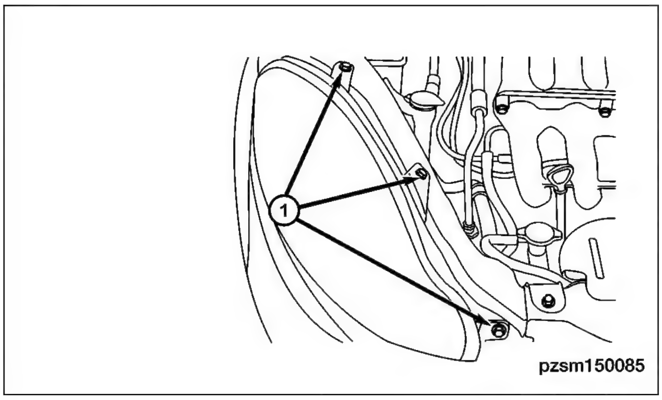
Front Combination Lamp Assembly

Removal & Installation

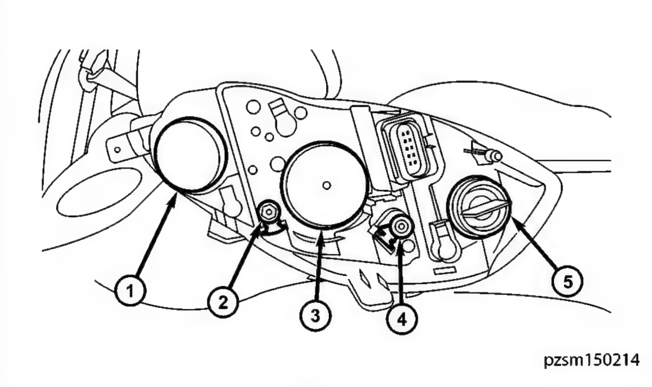
1. Open the hood.
2. Disconnect the front combination lamp assembly electrical connector.
3. Remove the grille retaining screws (1).



4. Remove the three front combination lamp assembly retaining bolts (1).



5. Remove the front combination lamp assembly carefully.



1	High Beam Lamp Bulb Front Position Lamp Bulb	12 V (65 W) 12 V (5 W)
2	Horizontal Adjusting Nut	
3	Low Beam Lamp Bulb	12 V (55 W)
4	Vertical Adjusting Nut	
5	Front Turn Signal Lamp Bulb	12 V (21 W)

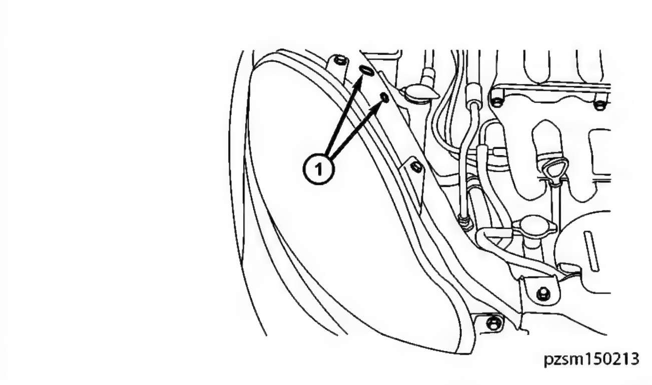
6. Installation is in the reverse order of removal.

Headlamp Adjustment Procedure

NOTE :
Follow all local laws and regulations and verify the following items before adjustment:

1. Check the following before starting the headlamp adjustment procedure:
   - All tires are filled to the proper tire pressure.
   - The vehicle is unloaded (except for spare tire and tools, and include driver’s weight for sedan).
   - The vehicle should be parked on a level surface.
   - The headlights are clean.
   - The headlights are working properly.
2. Park the vehicle on a level surface approximately 10 meters from the vertical wall or screen directly in front of it.

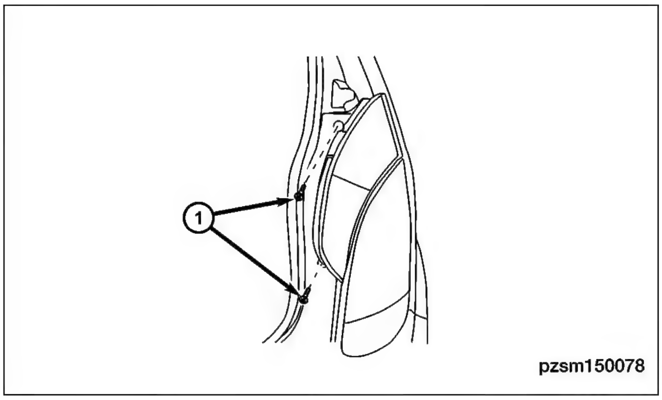
   NOTE: The vertical wall or screen must be a minimum of 2.4 meters wide.
3. Use a screwdriver into the two adjustment holes (1) to adjust the headlamp to proper specifications.



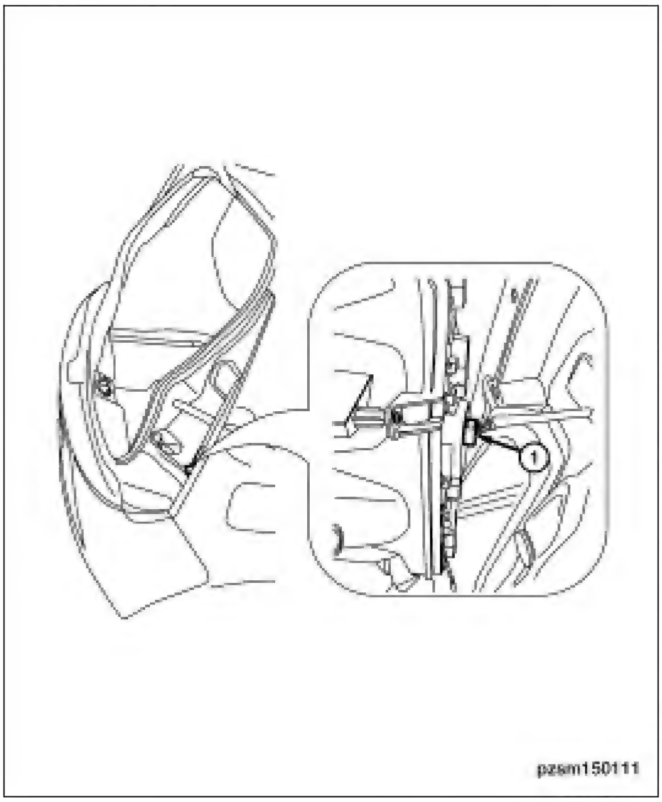
Rear Combination Lamp Assembly

Removal & Installation

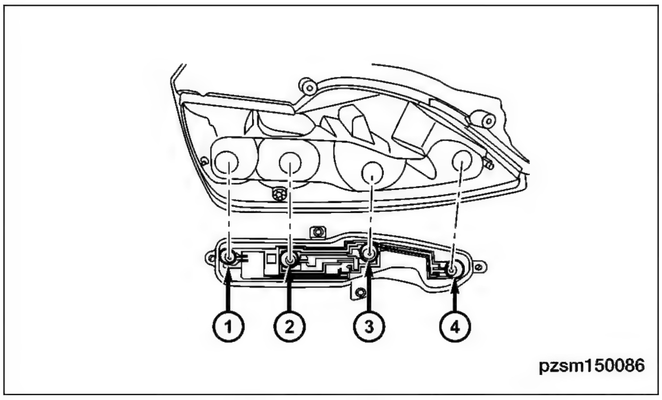
1. Open the rear hatch.
2. Removal the two rear combination lamp retaining screws (1).



3. Disconnect the rear combination lamp electrical connector (1).



4. Remove the rear combination lamp carefully.



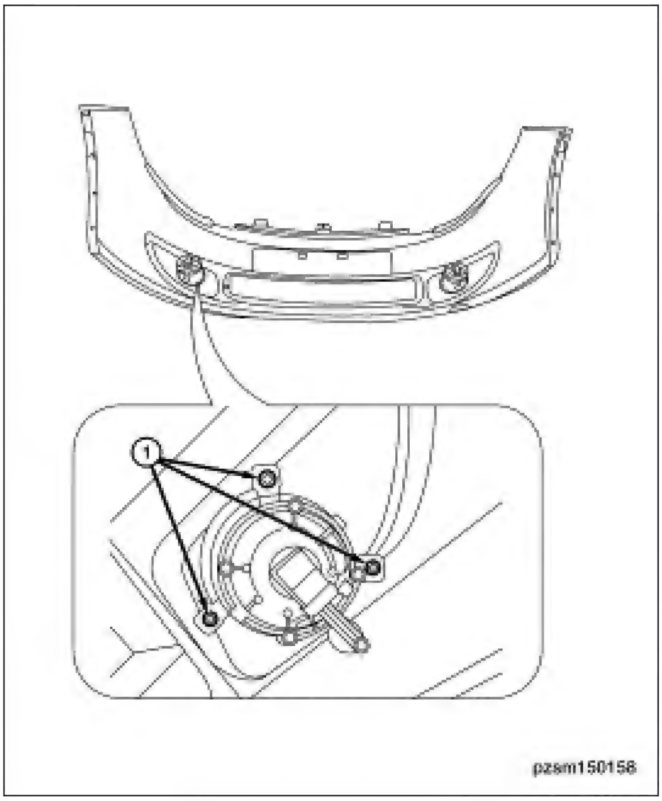
1	Rear Turn Signal Lamp Bulb	12 V (21 W)
2	Stop Lamp	12 V (21 W)
3	Rear Position Lamp Bulb	12 V (5 - 21 W)
4	Rear Fog Lamp Bulb/Backup Lamp Bulb	12 V (21 W)

5. Replace the bulbs.
6. Installation is in the reverse order of removal.

Front Fog Lamp

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the three front fog lamp retaining screws (1).

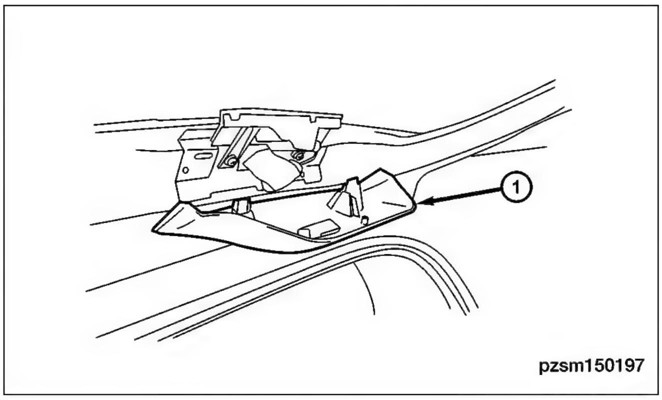


3. Disconnect the fog lamp electrical connector.
4. Remove the fog lamp.
5. Replace the bulb.
6. Installation is in the reverse order of removal.

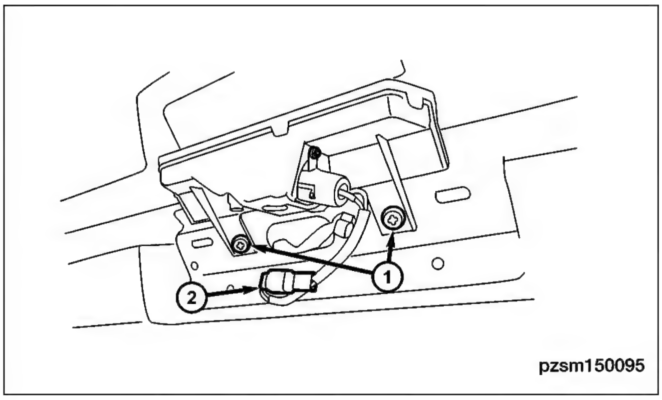
High Mounted Stop Lamp

Removal & Installation

1. Turn the ignition switch off.
2. Open the rear hatch.
3. Remove the high mounted stop lamp cover (1).



4. Remove the high mounted stop lamp mounting screws (1).
5. Disconnect the high mounted stop lamp electrical connector (2).

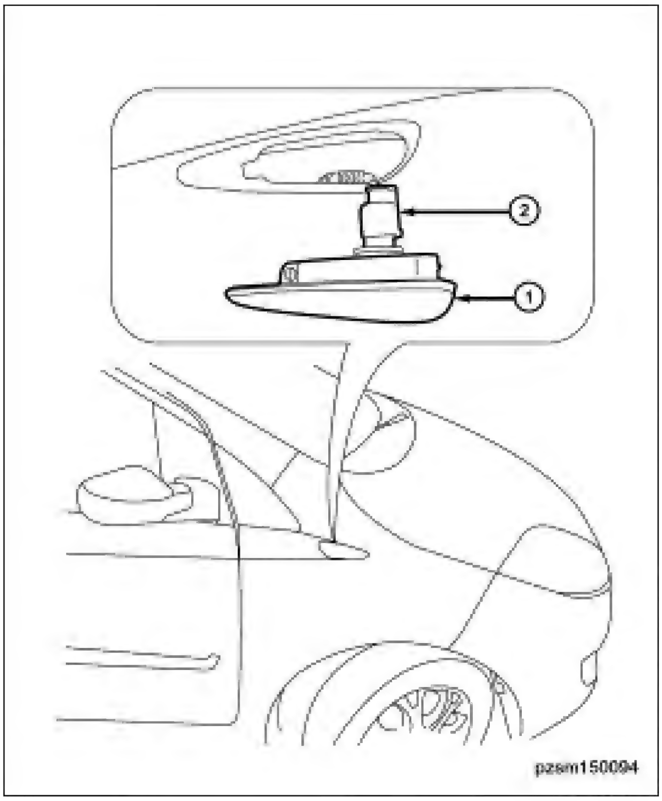


6. Remove the high mounted stop lamp.
7. Replace the bulb.
8. Installation is in the reverse order of removal.

Side Turn Signal Lamp

Removal & Installation

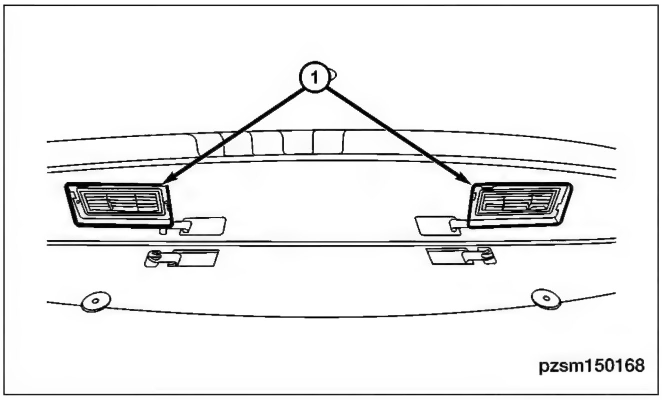
1. Disconnect the negative battery cable.
2. Gently pry the side turn signal lamp (1) loose from the front fender.
3. Disconnect the side turn signal lamp electrical connector (2).
4. Replace the bulb.
5. Installation is in the reverse order of removal.



License Plate Lamp

Removal & Installation

1. Using a plastic trim stick, remove the license plate lamp (1).



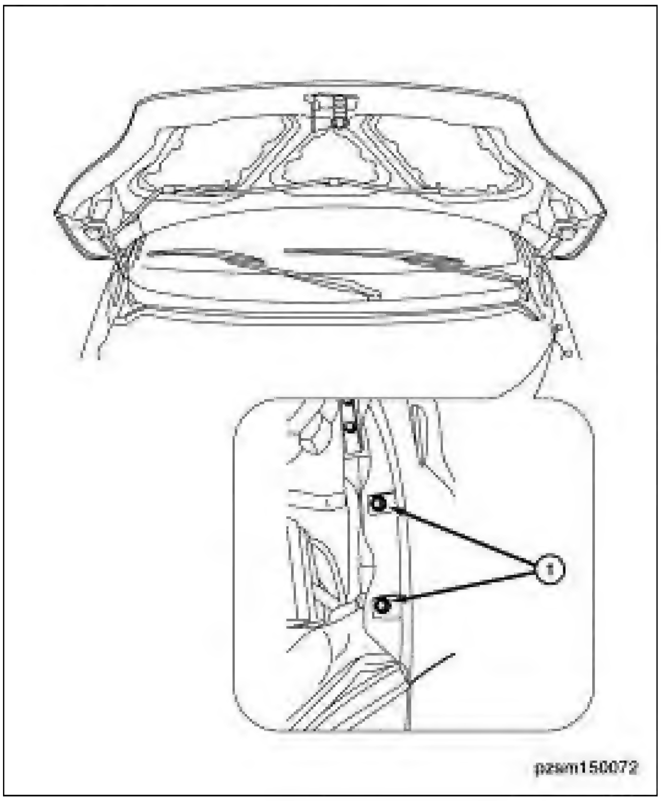
2. Disconnect the license plate lamp electrical connector.
3. Replace the bulb.
4. Installation is in the reverse order of removal.

FENDER

Front Fender

Removal & Installation

1. Remove the front bumper (See Front Bumper Removal & Installation in Section 15 Body & Accessories).
2. Remove the bolts connecting the fender and the dust shield.
3. Remove the bolts (1) on the fender apron.



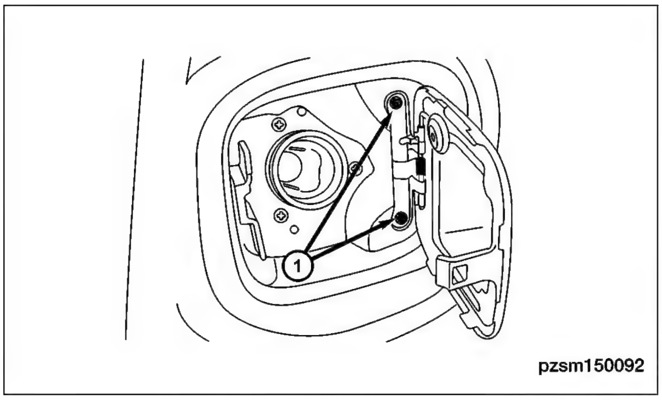
4. Remove the bolts connecting the fender to the body.
5. Installation is in the reverse order of removal.

FUEL DOOR

Fuel Door

Removal & Installation

1. Open the fuel door.
2. Remove the two fuel door retaining bolts (1).



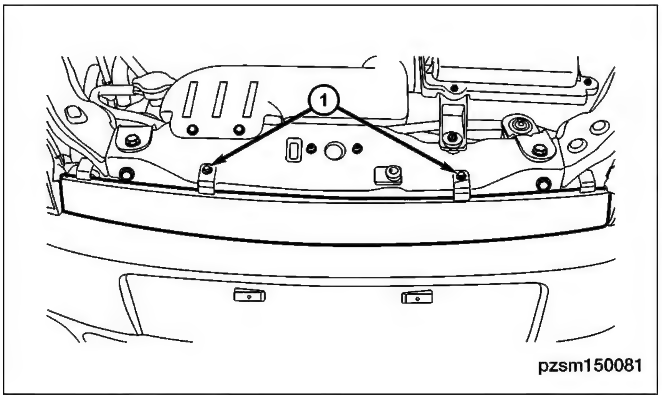
3. Remove the fuel door.
4. Installation is in the reverse order of removal.

GRILLE

Grille

Removal & Installation

1. Open the hood.
2. Remove the grille retaining screws (1).



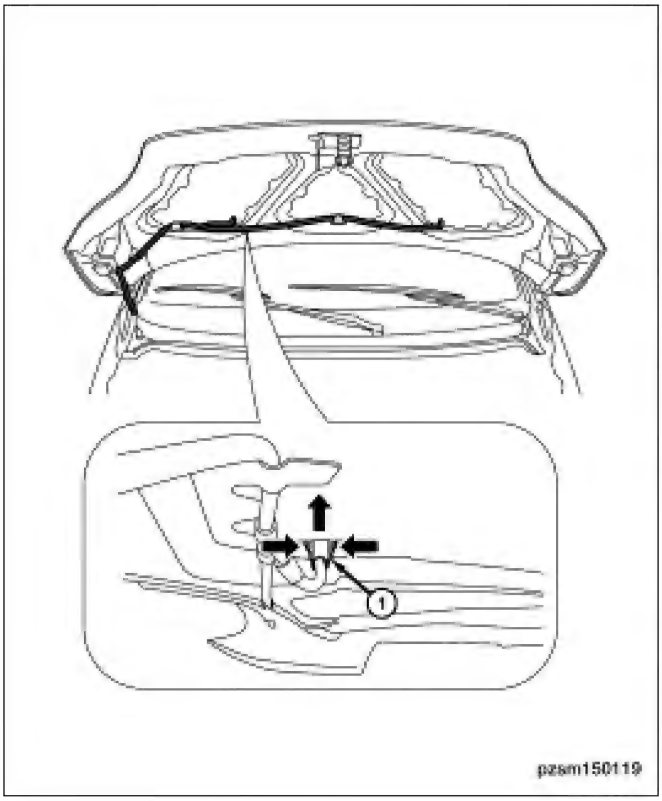
3. Remove the grille from the vehicle.
4. Installation is in the reverse order of removal.

HOOD

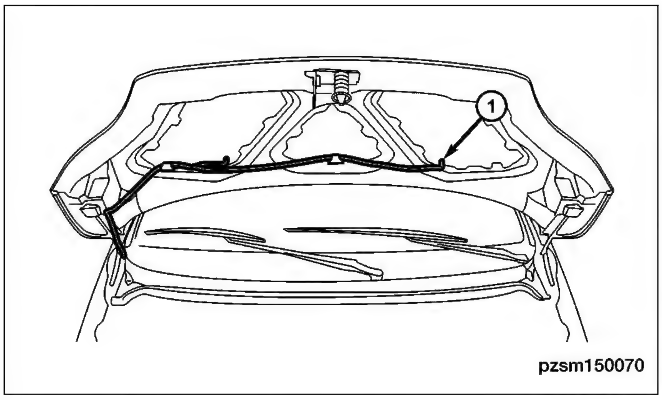
Hood

Removal & Installation

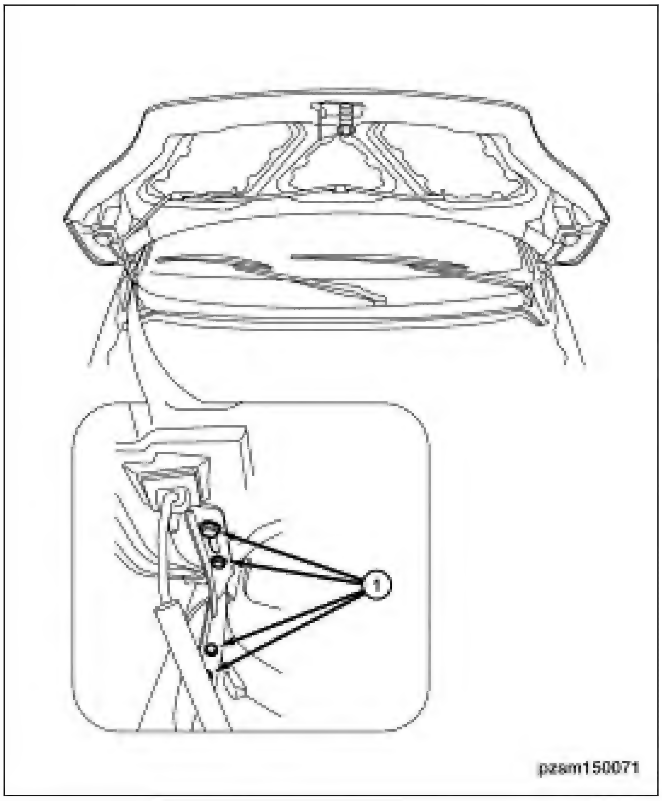
1. Loosen the windshield washer hose and then remove the spray nozzle (1).


1
pzsm150119

2. Remove the washer hose (1).


1
pzsm150070

3. Remove the retaining bolts (left and right side) (1) and set the hood aside.

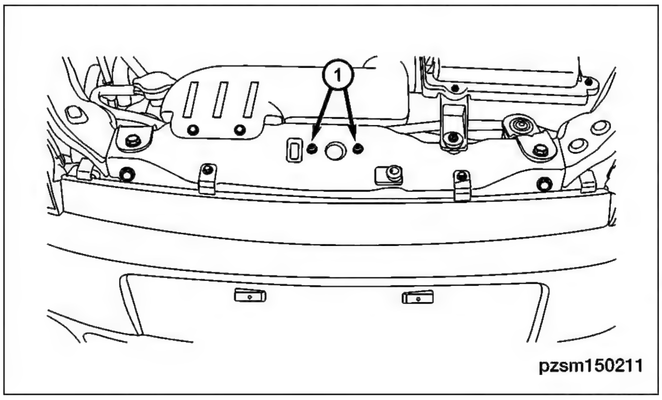


4. Installation is in the reverse order of removal.

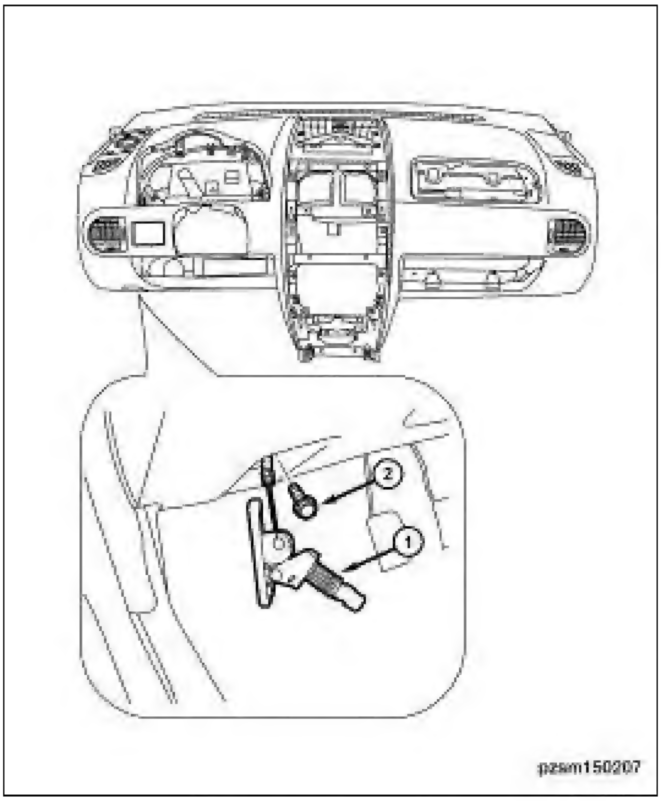
Hood Release Cable

Removal & Installation

1. Remove the left fender inner lining (See Fender Removal & Installation in Section 15 Body & Accessories).
2. Remove the hood lock retaining screws (1) and remove the hood release cable from the hood lock.



3. Remove the hood release lever retaining bolt (2).
4. Remove the hood release lever (1).



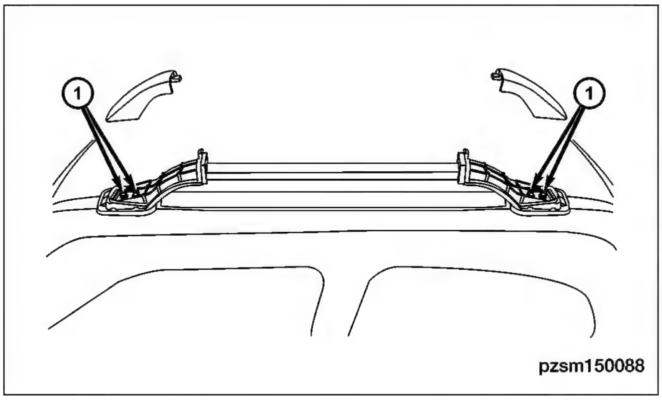
5. Remove the hood release cable from the hood release lever.
6. Installation is in the reverse order of removal.

LUGGAGE RACK

Luggage Rack

Removal & Installation

1. Remove the luggage rack bolt covers and then remove the mounting bolts (1).



2. Remove the luggage rack.
3. Installation is in the reverse order of removal.

HORN

Description

A dual note electric horn system is installed on this vehicle. The horn system features electromagnetic horns. The horn system includes the following components:

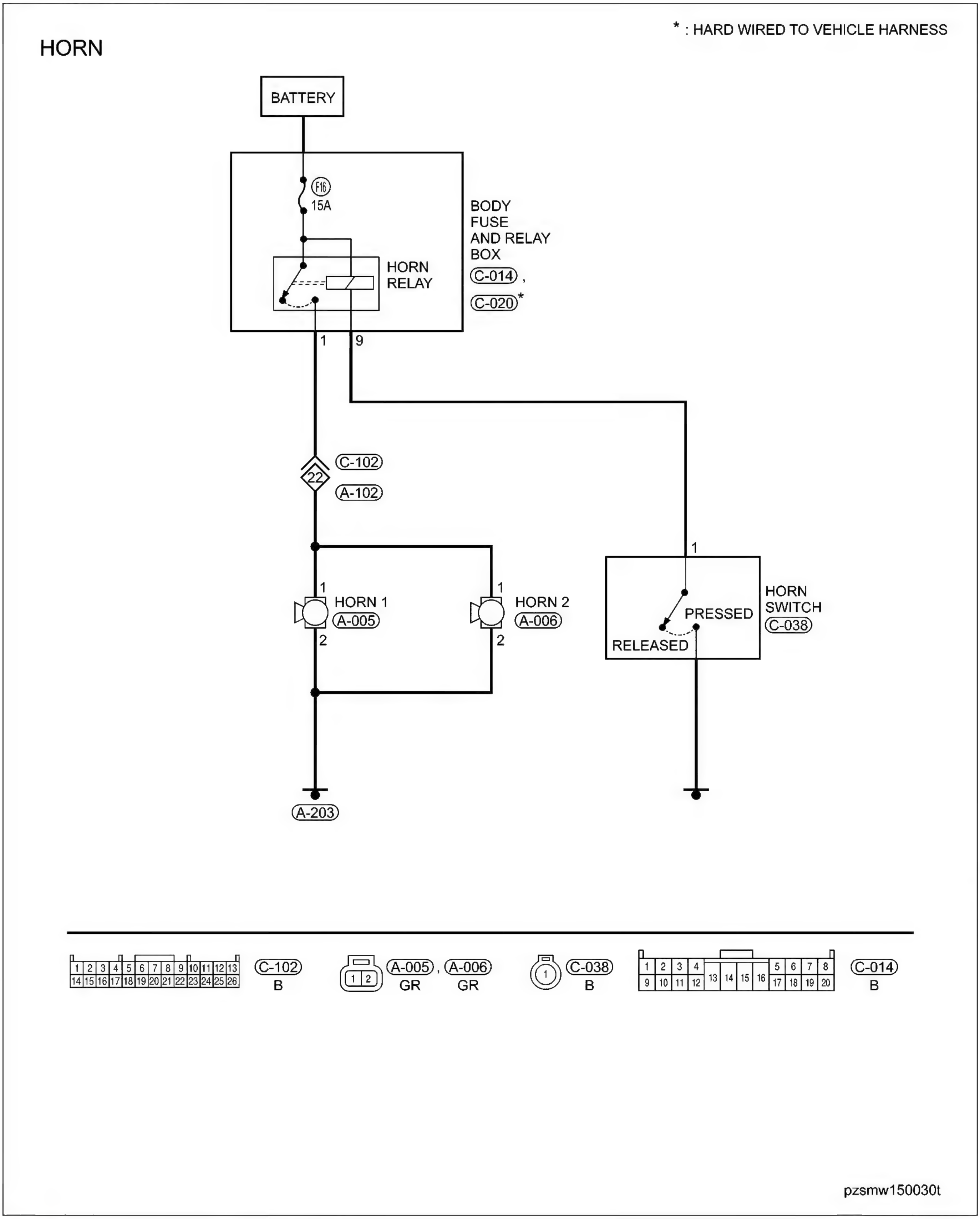
- Horn - The horns are located under the headlamp in the front bumper.
- Horn Switch - The horn switch is located under the driver airbag.

Operation

The horns operate on voltage supplied by the horn relay in the Body Fuse and Relay Box. The horn system circuit is designed so that the system will remain operational, regardless of the ignition switch position.

Electrical Schematics

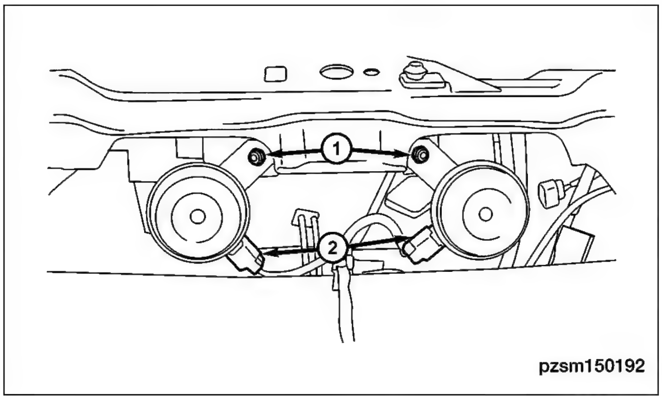
Horn (Page 1 of 1)


* : HARD WIRED TO VEHICLE HARNESS
HORN
BATTERY
F16
15A
HORN RELAY
BODY FUSE AND RELAY BOX
C-014 ,
C-020*
1
9
22
C-102
A-102
1
HORN 1
A-005
2
1
HORN 2
A-006
2
1
PRESSED
RELEASED
HORN SWITCH
C-038
A-203
C-102
B
A-005 , A-006
GR
GR
C-038
B
C-014
B
pzsmw150030t

Horn

Removal & Installation

1. Disconnect the negative battery cable.
2. Disconnect the horn electrical connectors (2).
3. Remove the horn retaining bolts (1) and remove the horns.



4. Installation is in the reverse order of removal.

MIRRORS

Description

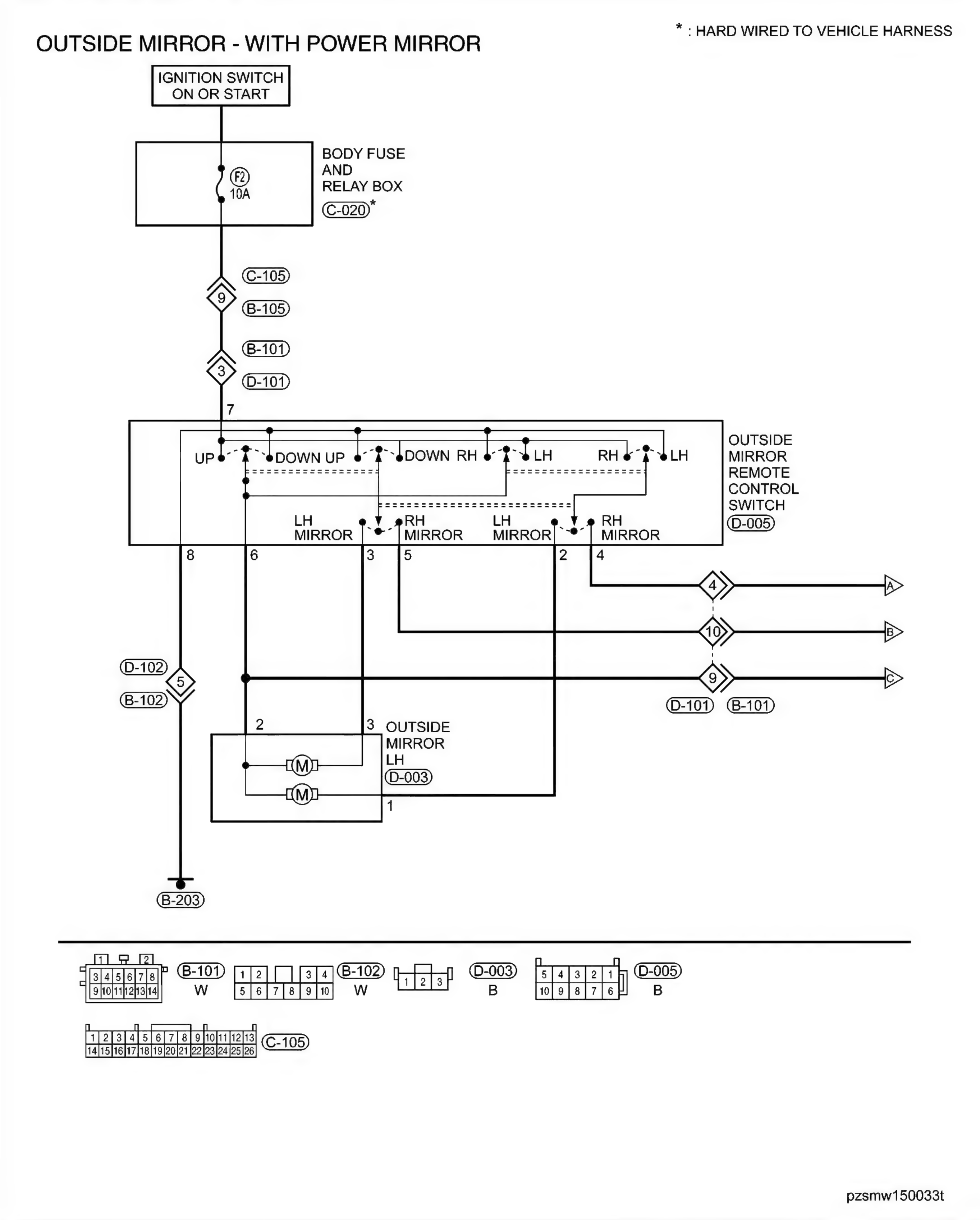
The mirrors are controlled by a single switch assembly located on the driver's door trim panel. A three-position switch selects the right or left power mirror for adjustment. A momentary joystick directional switch allows the driver to adjust the selected power mirror in the Up & Down or Right & Left directions. The heated mirror system is controlled by Body Control Module (BCM). When there is water vapor on the mirrors, the heated mirrors will eliminate the water vapor.

Operation

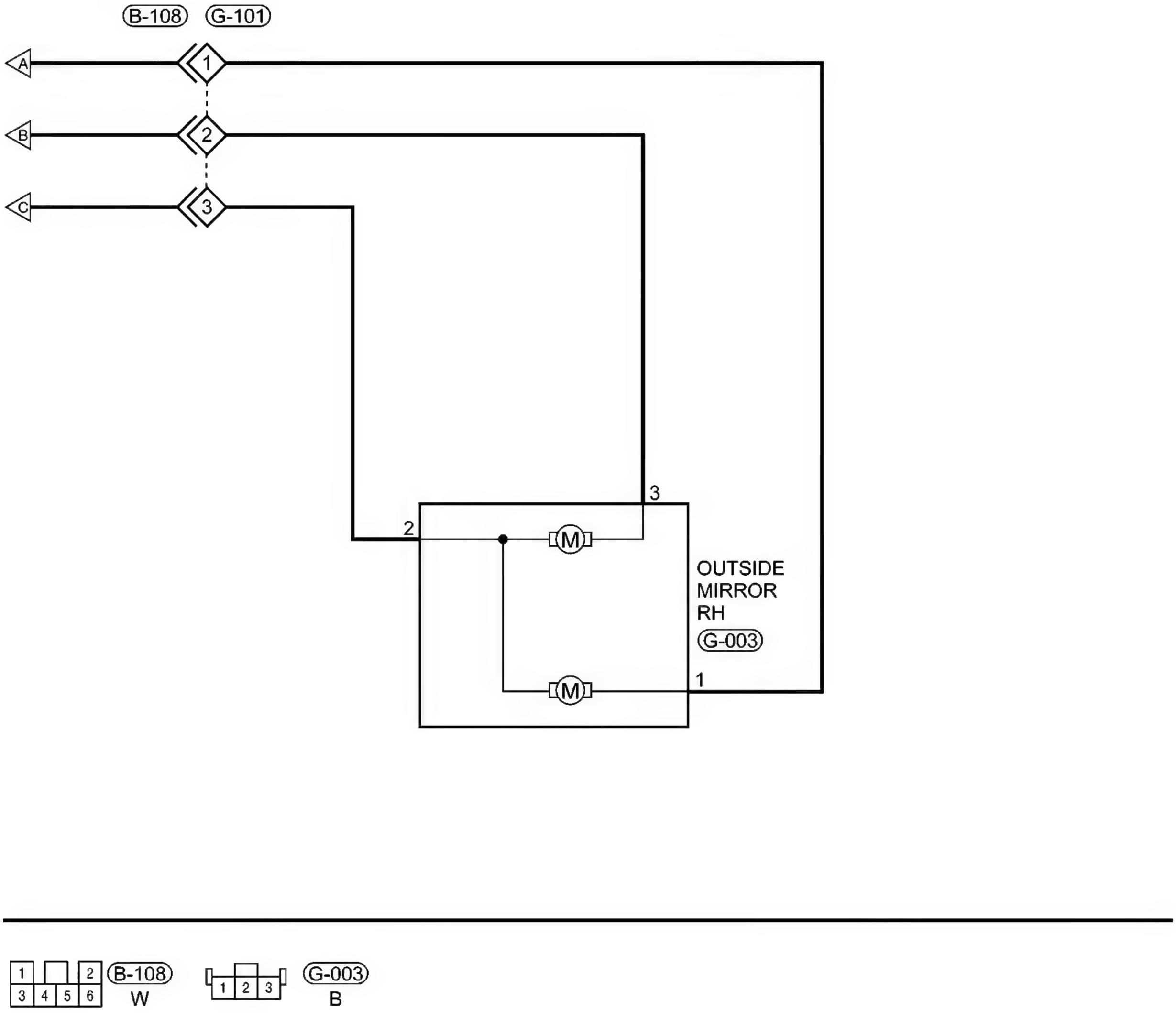
Use the mirror select switch, located on the driver's door trim panel, to adjust the view obtained in the outside mirrors. Rotate the joystick for Left or Right mirror selection. Select a mirror and press the joystick that correspond with the direction that you want the mirror to move.

Electrical Schematics

Power Mirrors (Page 1 of 2)


OUTSIDE MIRROR - WITH POWER MIRROR
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ON OR START
BODY FUSE AND RELAY BOX
C-020*
F2
10A
C-105
9
B-105
B-101
3
D-101
7
UP
DOWN
UP
DOWN
RH
LH
RH
LH
LH MIRROR
RH MIRROR
LH MIRROR
RH MIRROR
OUTSIDE MIRROR REMOTE CONTROL SWITCH
D-005
8
6
3
5
2
4
4
A
10
B
9
C
D-101
B-101
D-102
5
B-102
2
3
OUTSIDE MIRROR LH
D-003
M
M
1
B-203
B-101
W
B-102
W
D-003
B
D-005
B
C-105
pzsmw150033t

Power Mirrors (Page 2 of 2)

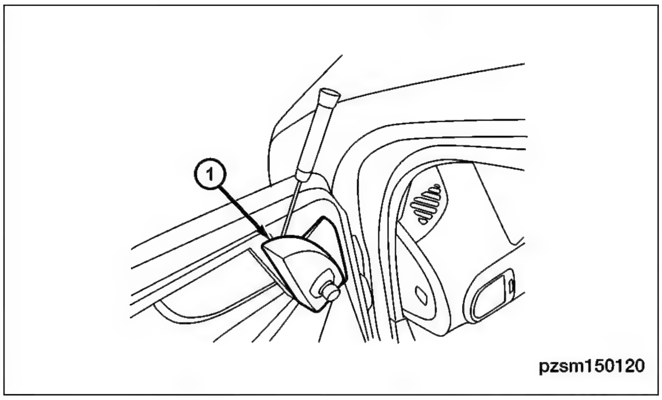

B-108
G-101
A
B
C
1
2
3
3
2
M
M
1
OUTSIDE MIRROR RH
G-003
1
2
3 4 5 6
B-108
W
1 2 3
G-003
B

pzsmw150038t

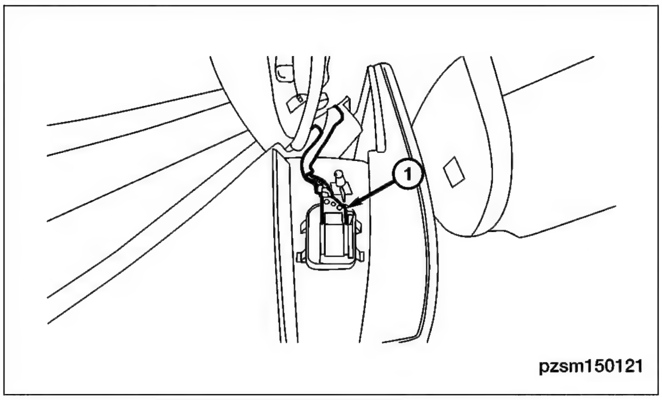
Outside Mirror

Removal & Installation

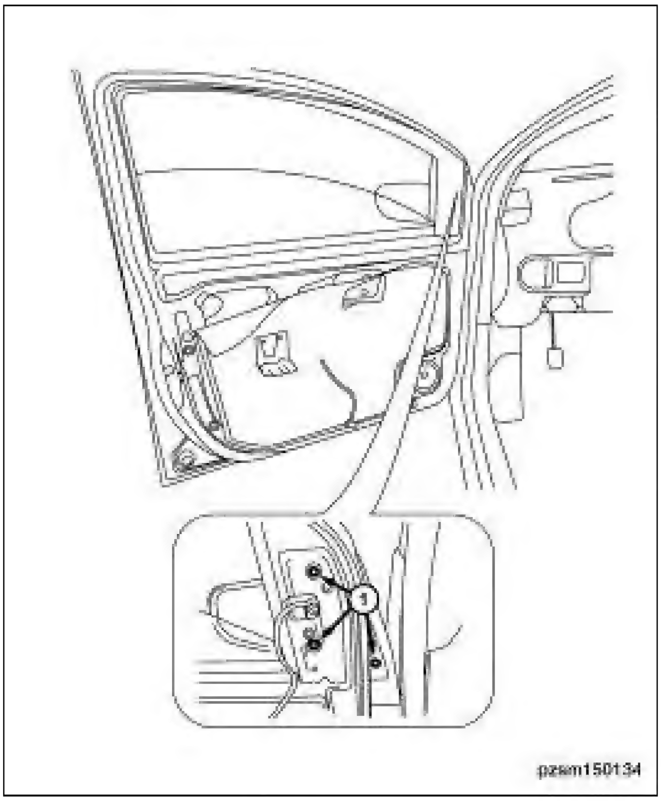
1. Turn the ignition switch off.
2. Using a trim stick, remove the outside mirror switch panel (1) from the door trim panel.



3. Disconnect the outside mirror switch electrical connector (1).



4. Remove the outside mirror retaining nuts (1), and remove the outside mirror electrical connector. (Tighten: Outside mirror retaining nuts to 7 ± 1 N·m)



5. Remove the outside mirror.
6. Installation is in the reverse order of removal.

Installation Notes:

- If replacing the outside mirror lens, remove the lens and replace it before reinstalling the mirror.

PAINT

Paint Codes

Specification

NO	COLOR	ITEM CODE
1	Jade Blue	GE
2	Indicolite Gold	DY
3	Dark Iron Gray	GH
4	Cuprite Red	NA
5	Aegean Blue	HU
6	Azure Blue	VC

PARKING SONAR

Description

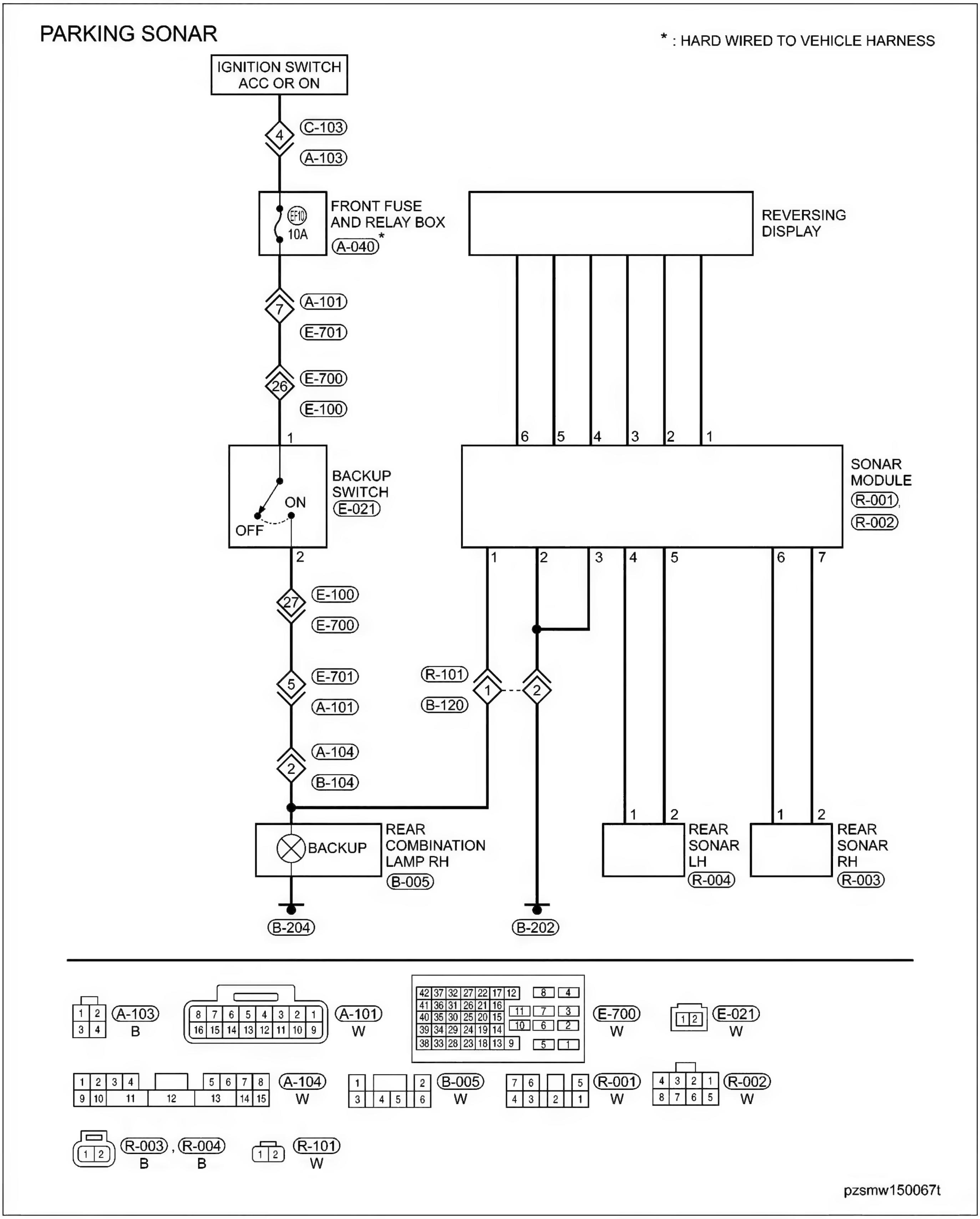
When the transaxle selector lever is in the ″R″ position, a stationary object will be detected by the rear sonar sensor causing the sonar buzzer to sound a tone. As the vehicle moves closer to the object, the rate of the tone will increase. When the object is very close to the vehicle, the tone will sound continuously.

Operation

With power and ground supplied, transaxle gear selector lever in ″R″ position, the rear sonar sensor will detect obstacles within 1.5 m of the rear sonar sensors. The sensor signal inputs are transmitted to the Body Control Module (BCM). The BCM communicates this signal to the instrument cluster to activate the buzzer. The vehicle operator is notified of obstacles by a varied rate of tone from the sonar buzzer depending on the distance of the obstacle being sensed.

Electrical Schematics

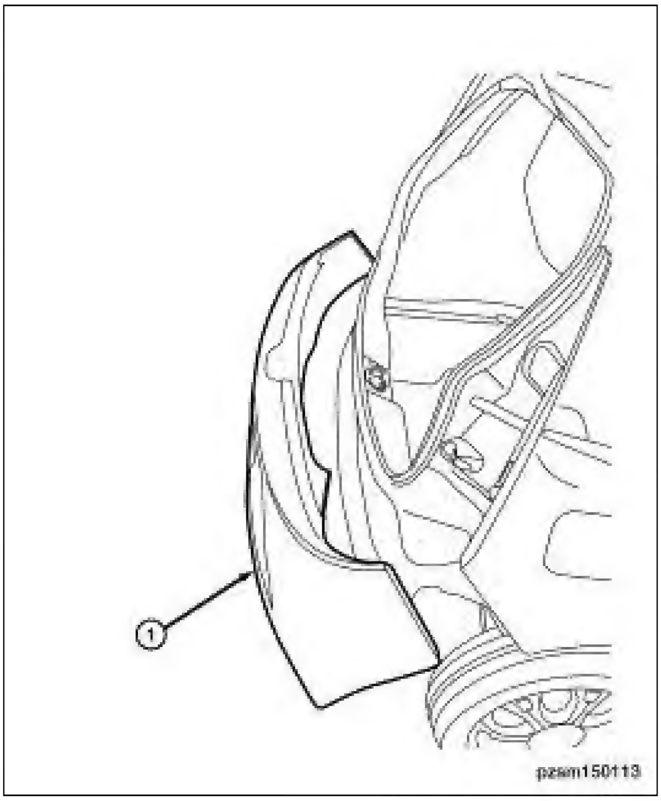
Parking Sonar (Page 1 of 1)


PARKING SONAR
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ACC OR ON
4 C-103 A-103
EF10 10A
FRONT FUSE AND RELAY BOX
A-040*
7 A-101 E-701
26 E-700 E-100
BACKUP SWITCH
E-021
ON
OFF
27 E-100 E-700
5 E-701 A-101
2 A-104 B-104
REAR COMBINATION LAMP RH
BACKUP
B-005
B-204
REVERSING DISPLAY
SONAR MODULE
R-001, R-002
R-101 B-120
B-202
REAR SONAR LH
R-004
REAR SONAR RH
R-003
A-103 B
A-101 W
E-700 W
E-021 W
A-104 W
B-005 W
R-001 W
R-002 W
R-003, R-004 B B
R-101 W
pzsmw150067t

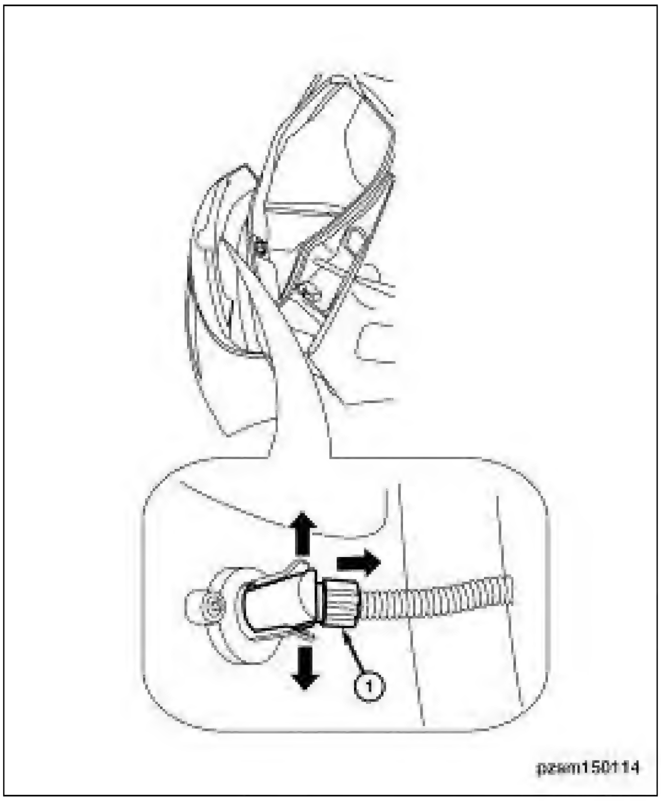
Sonar Sensor

Removal & Installation

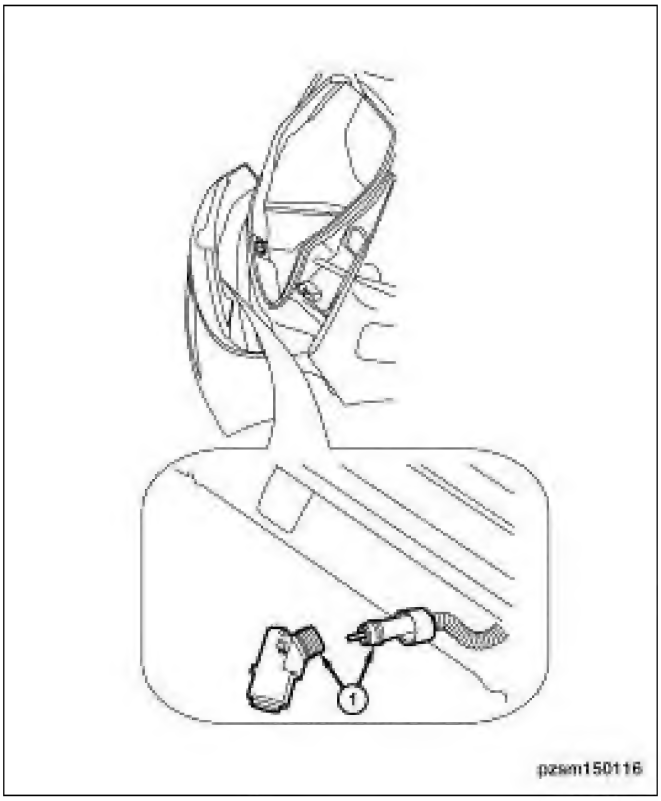
1. Disconnect the negative battery cable.
2. Remove the rear bumper (1) (See Rear Bumper Removal & Installation in Section 15 Body & Accessories).



3. Remove the parking sonar (1).


1
pzsm150114

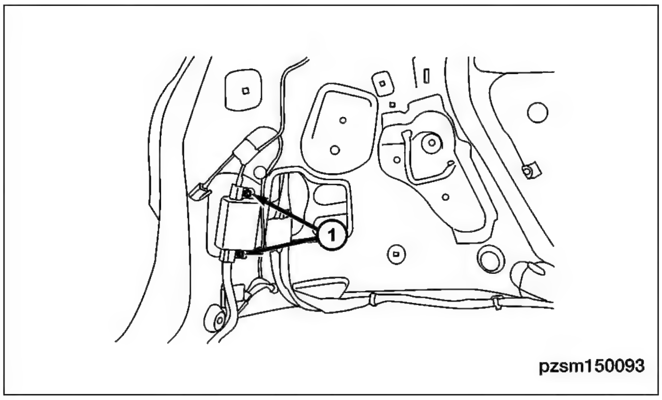
4. Disconnect the parking sonar and remove the sonar sensor (1).
5. Installation is in the reverse order of removal.


1
pzsm150116

Sonar Module

Removal & Installation

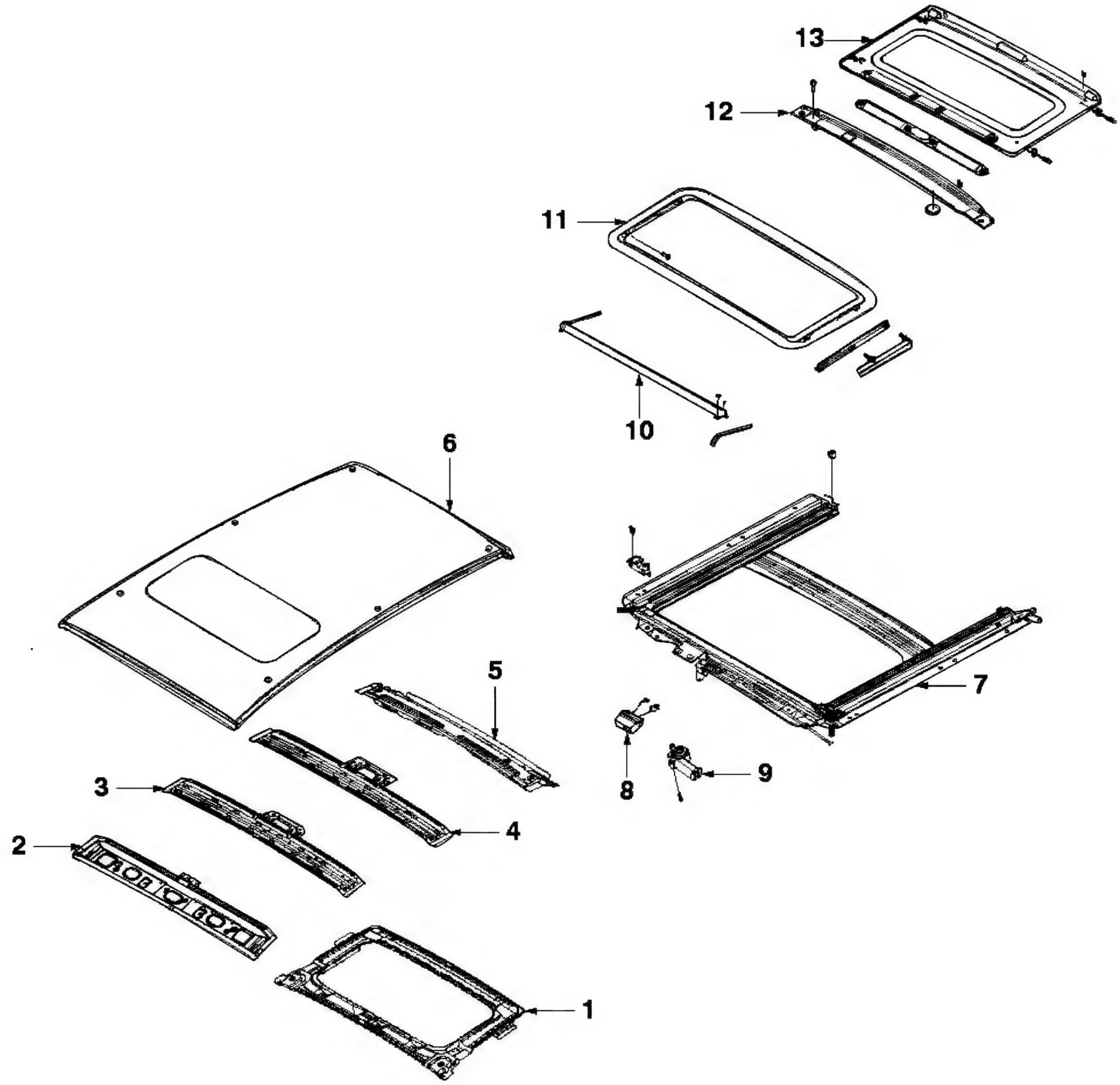
1. Remove the C-pillar trim panel (See C-Pillar Trim Panel Removal & Installation in Section 15 Body & Accessories).
2. Remove the sonar module retaining bolts (1).
3. Disconnect the sonar module electrical connector.



4. Remove the sonar module.
5. Installation is in the reverse order of removal.

SUNROOF

Description



13
12
11
10
6
5
7
3
4
8
9
2
1

besm150008

The sunroof consists of the following components:

- Sunroof Frame (1)
- Windshield Frame (2)
- Sunroof Central Bracket (3)
- Sunroof Back Bracket (4)
- Rear Roof Frame (5)
- Head Liner (6)
- Sunroof Track (7)
- Sunroof Module (8)
- Sunroof Motor (9)
- Sunroof Deflector (10)
- Sunroof Glass (11)
- Guiding Gutter (12)
- Sun Visor (13)

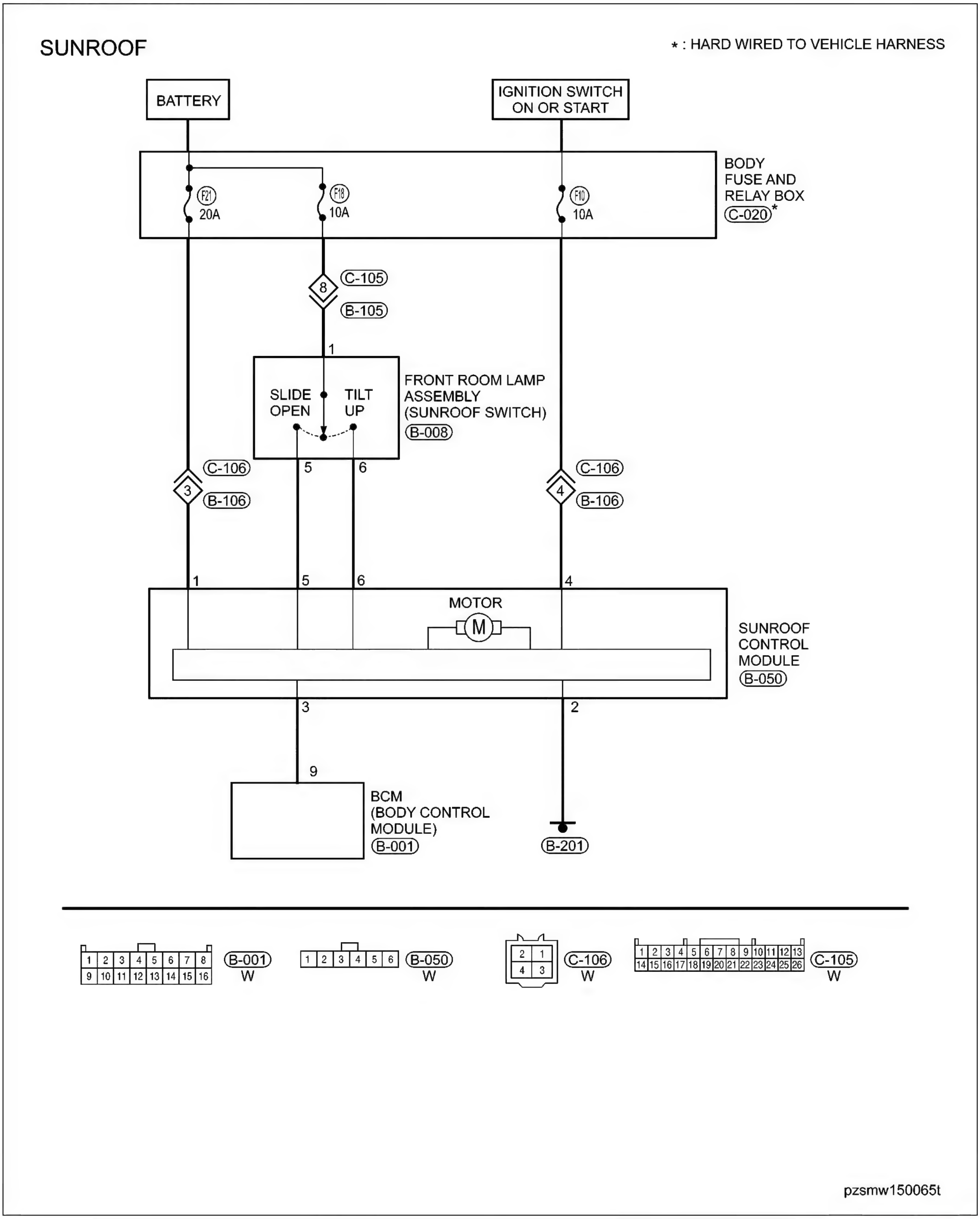
Operation

The sunroof control module monitors the sunroof switch input. The sunroof control module controls the output of the sunroof motor, to move the sunroof glass to the requested position. The power sunroof will operate with the ignition switch turned to ON.

NOTE :
After the ignition key is removed, the sunroof will close automatically.

Electrical Schematics

Sunroof (Page 1 of 1)


SUNROOF
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
F21
20A
F18
10A
F10
10A
BODY FUSE AND RELAY BOX
C-020*
8
C-105
B-105
1
SLIDE OPEN
TILT UP
FRONT ROOM LAMP ASSEMBLY (SUNROOF SWITCH)
B-008
5
6
C-106
3
B-106
C-106
4
B-106
1
5
6
4
MOTOR
M
SUNROOF CONTROL MODULE
B-050
3
2
9
BCM (BODY CONTROL MODULE)
B-001
B-201
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B-001
W
1 2 3 4 5 6
B-050
W
2 1
4 3
C-106
W
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
C-105
W
pzsmw150065t

DIAGNOSIS & TESTING

Sunroof Memory Relearn

Sunroof Memory Loss

The sunroof should be initialized if any of the following conditions occur:

(1) Sunroof Power Failure

- If power is lost during the operation of sunroof (the Sunroof Control Module will record a malfunction) and the sunroof will need to be initialized.
- If power is lost within five seconds after normal operation has stopped, the Sunroof Control Module will not have enough time to store parameters, and the sunroof will need to be initialized.

(2) Sunroof Mechanical Failure

- If after the sunroof has been used for a period of time, and can not be closed in position (there is a gap between mechanical components). The time is generally about 2 years before the sunroof will need to be initialized.

Sunroof Initialization Steps

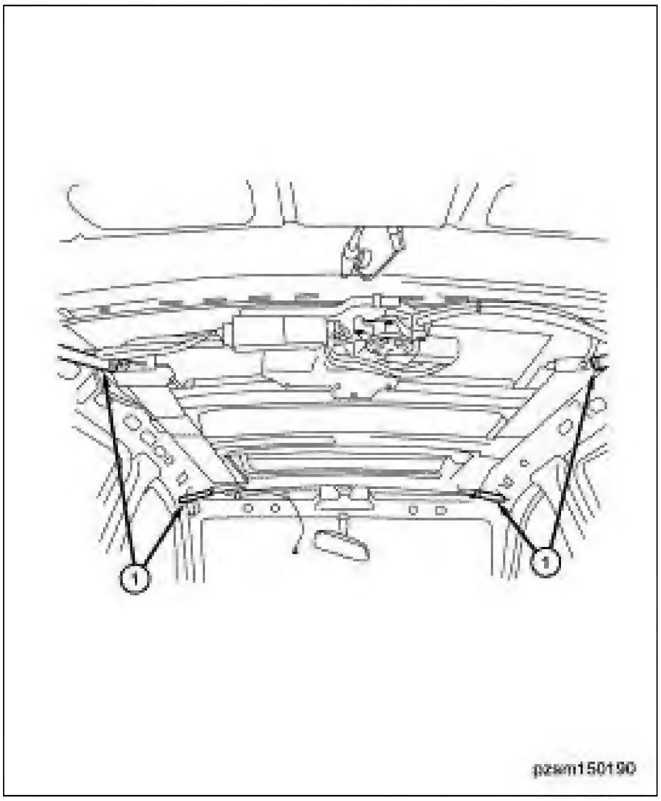
- When the sunroof is closed, press and hold the open switch until the sunroof is completely opened, keep pressing the switch for five seconds, then release the switch.
- Press and hold the sunroof close switch within two seconds until the sunroof is completely closed, keep pressing the switch for five seconds, then release the switch.

ON-VEHICLE SERVICE

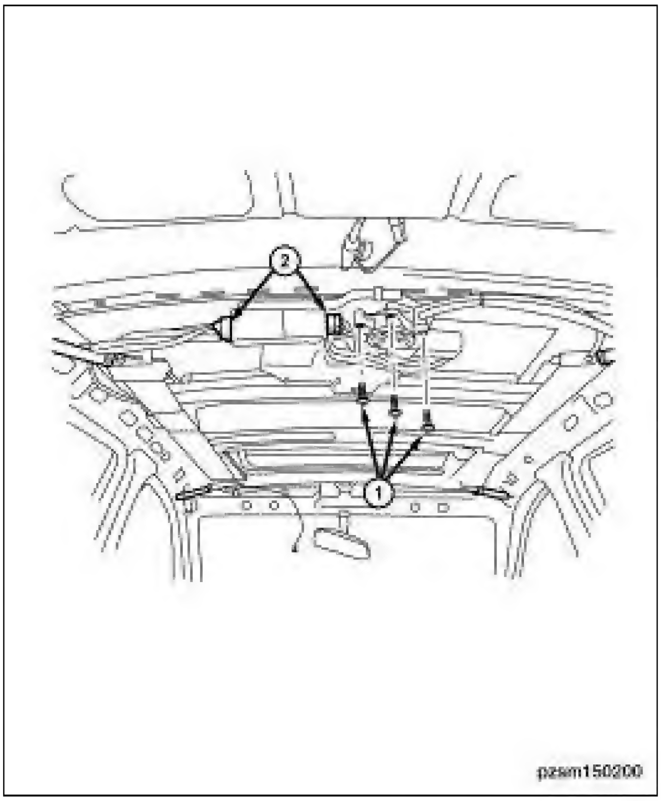
Sunroof Assembly

Removal & Installation

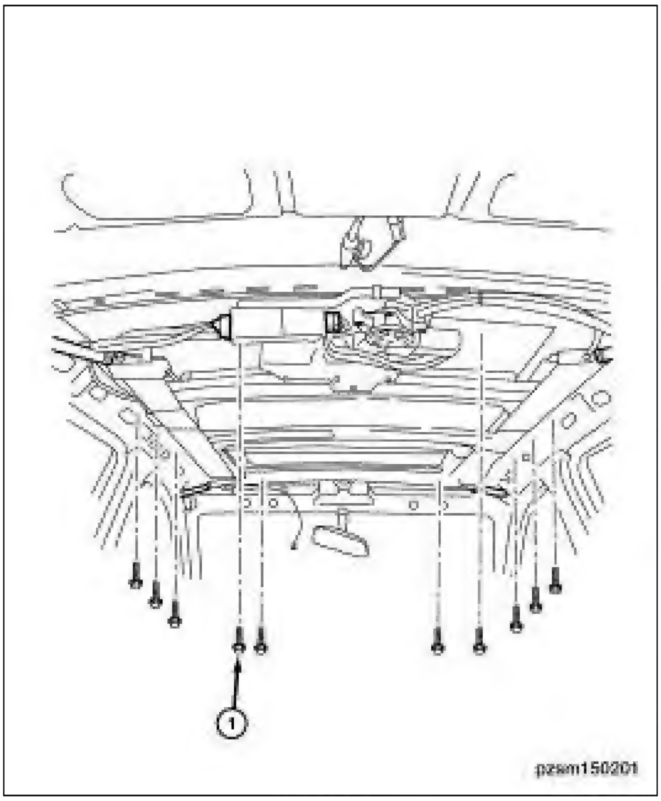
1. Operate the sunroof switch to lift the sunroof to the full tilt position.
2. Disconnect the negative battery cable.
3. Push the inner trim strip (left and right inner side cover) rearwards to remove.
4. Remove the headliner (See Headliner Removal & Installation in Section 15 Body & Accessories).
5. Disconnect the four water hose clamps (1).



6. Remove the sunroof motor retaining screws (1).
7. Remove the sunroof module electrical connector (2).



8. Remove the ten sunroof retaining bolts (1).



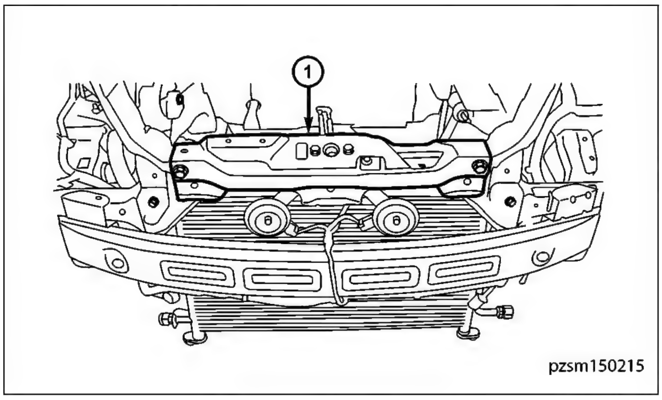
9. Remove the sunroof assembly.
10. Installation is in the reverse order of removal.

RADIATOR SUPPORT

Radiator Support

Removal & Installation

1. Remove the hood release cable (See Hood Release Cable Removal & Installation in Section 15 Body & Accessories).
2. Remove the grille (See Grille Removal & Installation in Section 15 Body & Accessories).
3. Remove the front bumper (See Front Bumper Removal & Installation in Section 15 Body & Accessories).
4. Remove the horns (See Horn Removal & Installation in Section 15 Body & Accessories).
5. Remove the radiator support retaining bolts and nuts.
6. Remove the radiator support (1).



7. Installation is in the reverse order of removal.

STATIONARY GLASS

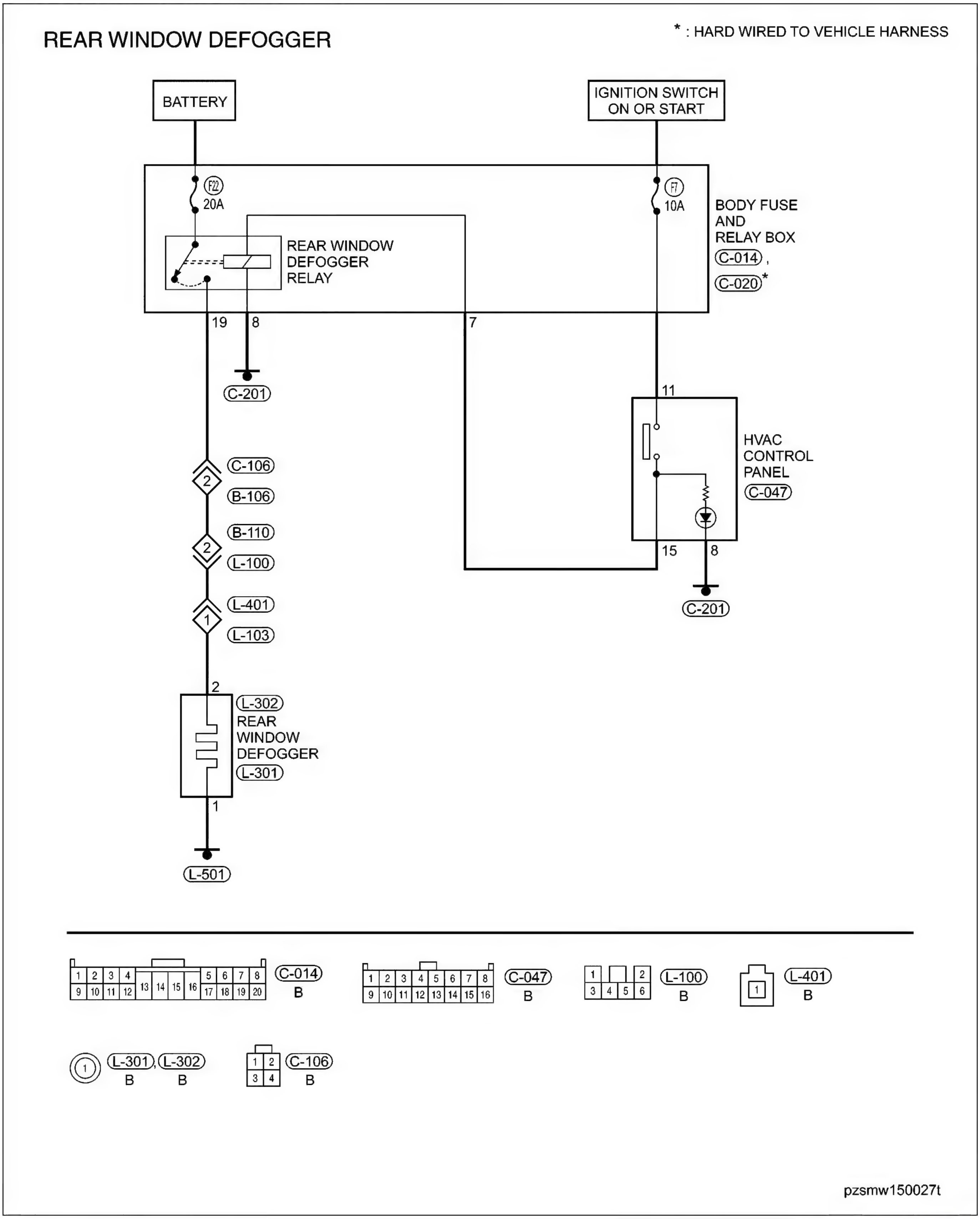
Description

The stationary glass is comprised of the following:

- Front Windshield
- Rear Window
- Rear Window Defogger

Electrical Schematics

Rear Window Defogger (Page 1 of 1)


REAR WINDOW DEFOGGER
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
IGNITION SWITCH ON OR START
F22
20A
F7
10A
REAR WINDOW DEFOGGER RELAY
BODY FUSE AND RELAY BOX
C-014,
C-020*
19
8
7
C-201
11
HVAC CONTROL PANEL
C-047
15
8
C-201
C-106
2
B-106
B-110
2
L-100
L-401
1
L-103
2
L-302
REAR WINDOW DEFOGGER
L-301
1
L-501
C-014 B
C-047 B
L-100 B
L-401 B
L-301, L-302 B B
C-106 B
pzsmw150027t

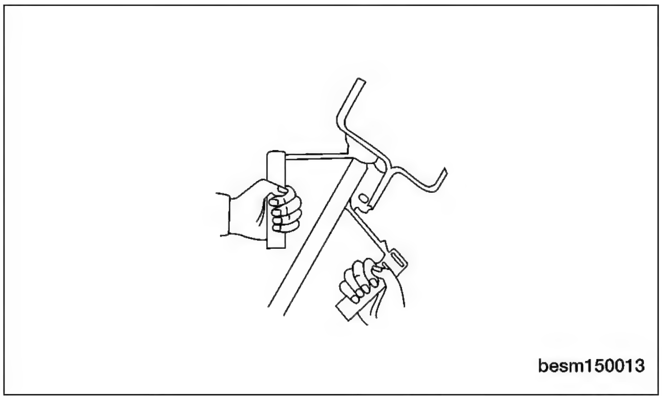
Front Windshield

Removal

1. Remove the wiper arms and the lower trim panel from the windshield (See Wiper Arm Removal & Installation in Section 15 Body & Accessories).
2. Using piano wire, insert the piano wire between the body and the glass. Attach wooden blocks to both ends of the piano wire.

CAUTION:

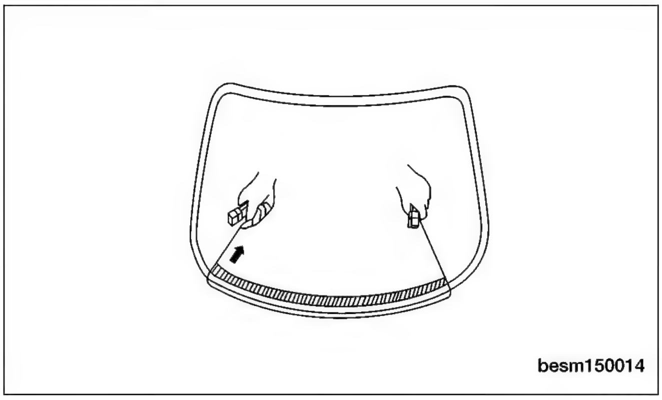
To prevent vehicle paint damage, use adhesive tape on painted surfaces during windshield removal. Place a plastic cover between the piano wire and the instrument panel to prevent the instrument panel from being scuffed when removing the glass.



3. Pull the piano wire around the glass, and cut off the bonding agent to remove the glass.

NOTE :

Leave as much bonding agent as possible on the body when removing the bonding portion of the glass.



Installation

1. Remove the rough portions on the body with a knife and clean the cut bonding agent with a rag soaked with cleaning solvent.

CAUTION:

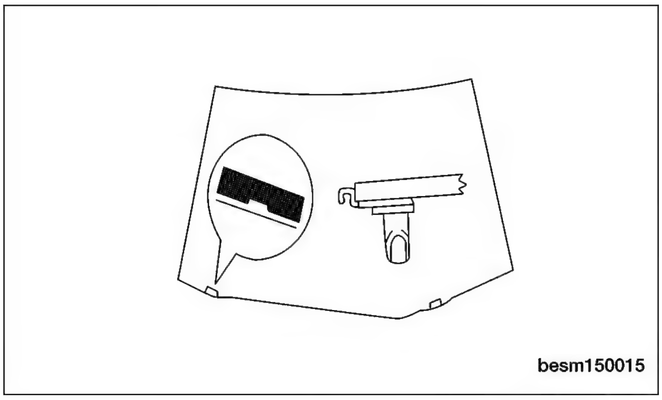
Even if the entire bonding agent has been cleared, you should also clean the body surface. Do not touch the glass surface after cleaning.

2. Remove the stopper with a knife.
3. Clear the bonding agent adhered to the glass with a scraper and clean the glass with glass cleaner.

NOTE :

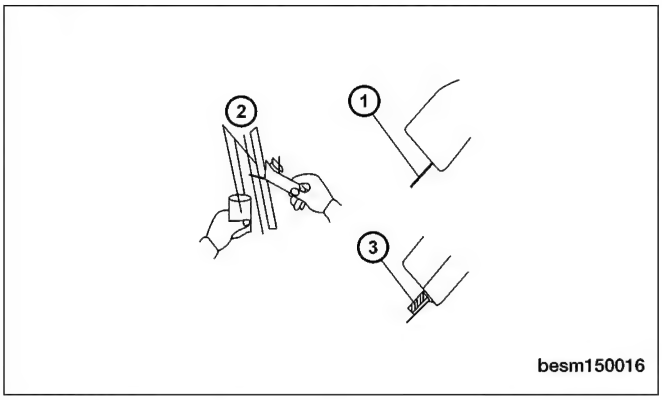
Do not touch the glass after cleaning.

4. Replace the clamping piece if necessary:
    - Remove the stopper with a knife
    - Remove the old clamping piece
    - Replace with a new clamping piece
5. Position the glass:
    - Place the glass in the proper position
    - Make reference marks on the glass and the body
    - Remove the glass
6. Clean the contact surface of the glass:
    - Clear any residue around the peripheral contact face of the glass with glass cleaner



NOTE :
Do not touch the glass surface after cleaning.

7. Install the water resistance piece:
    - Install the water resistance piece using double- face adhesive tape as shown in the figure.
8. Apply a layer of primer M on the contact surface of the body and apply a layer of primer M on the contact face of the body with a brush.



1 - Primer M	2 - Primer M	3 - Primer M

NOTE :
Allow the primer coat to dry for a minimum of 3 minutes. Do not apply the primer to the bonding agent. Do not save the opened primer M for later use.

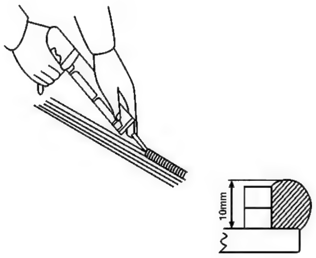
9. Apply a layer of primer G on the contact surface of the glass:
    - Apply a layer of primer G on the edges and the contact surface of the glass with a brush or sponge.
    - Wipe the excess primer off with a clean rag before it dries.

NOTE :
Allow the primer coat to dry for a minimum of 3 minutes. Do not apply the primer to the bonding agent. Do not save the opened primer G for later use.

10. Mixing the bonding agent:
    - Clean a mixing board and a scraper completely with solvent.
    - Thoroughly mix 500 grams of host crystal with 75 grams of hardener on a mixing board with a scraper.

NOTE :
Make sure that the molding is installed before the bonding agent has cured.

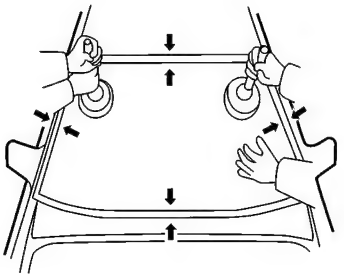
11. Applying the bonding agent:
    - Cut off the pot tip and fill the bonding agent into the pot.
    - Place the pot into the sealant gun.
    - Apply the bonding agent on the glass as shown in the figure.



besm150017

CAUTION:

Verify that the water resistant piece is adhered to the panel of the body as shown in the figure.



besm150018

12. To install the glass, align the reference marks on the glass and the body and then lightly press the glass into the body opening.
13. Apply the bonding agent on the edges of the glass with a scraper.
14. Remove any excessive bonding agent with a scraper.
15. Clamp the glass until the bonding agent has hardened.
16. Check for water leakage:
    - Perform the leakage test after the hardening period.
    - Seal any leaks with the proper sealant.
17. Install the upper molding of the windshield:
    - Install the upper windshield molding on the body and tap it lightly to fasten it.
    - Install the outer windshield molding.

Rear Window

Removal

1. Open the rear hatch.
2. Remove the rear hatch trim panel.
3. Remove the rear wiper motor and rear wiper arm.
4. Remove the double face adhesive tape at both ends of the molding with a scraper.
5. Rear window removal:
    - Using piano wire, insert the piano wire between the body and the glass.
    - Attach wooden blocks to both ends of the piano wire.
    - Pull the piano wire through between the body and the glass from inside of the vehicle.
    - Pull the piano wire along the bonding agent to cut it off.

CAUTION:

Do not let the piano wire damage the two stoppers.

- Remove the rear window.

Installation

1. Place the rear window molding around the glass and fit it manually.
2. Remove the rough portions on the body with a knife and clean the cut bonding agent with a rag soaked with cleaning solvent.

CAUTION:

Even if the entire bonding agent has been cleared, you should also clean the body surface. Do not touch the glass surface after cleaning.

3. Remove the stopper with a knife.
4. Clean the removed rear window:
    - Clean any bonding agent adhered to the glass with a scraper.
    - Remove the stopper with a knife.
    - Clean the glass with glass cleaner.

NOTE :

Do not touch the glass after cleaning

5. Position the glass:
    - Place the glass in the proper position
    - Make reference marks on the glass and the body
    - Remove the glass
6. Clean the contact surface of the glass:
    - Clear any residue around the peripheral contact face of the glass with glass cleaner.

NOTE :

Do not touch the glass surface after cleaning.

7. Apply a layer of primer M on the contact surface of the body with a brush.

NOTE :

Allow the primer coat to dry for a minimum of 3 minutes. Do not apply the primer to the bonding agent. Do not save the opened primer M for later use.

8. Apply a layer of primer G on the contact surface of the glass:
    - Apply a layer of primer G on the edges and the contact surface of the glass with a brush or sponge.
    - Wipe the excess primer off with a clean rag before it dries.

NOTE :

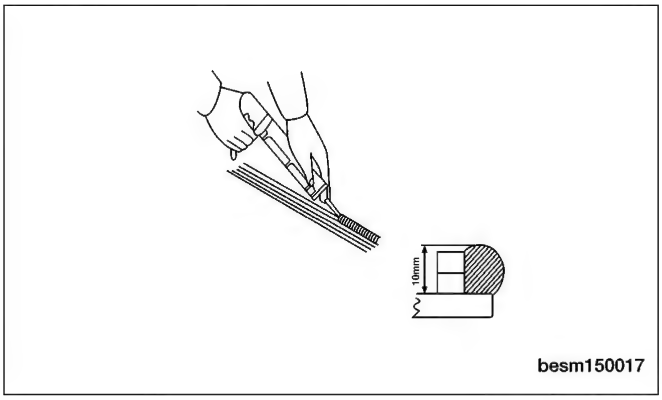
Allow the primer coat to dry for a minimum of 3 minutes. Do not apply the primer to the bonding agent. Do not save the opened primer G for later use.

9. Mixing the bonding agent:
    - Clean a mixing board and a scraper completely with solvent.
    - Thoroughly mix 500 grams of host crystal with 75 grams of hardener on a mixing board with a scraper.

NOTE :

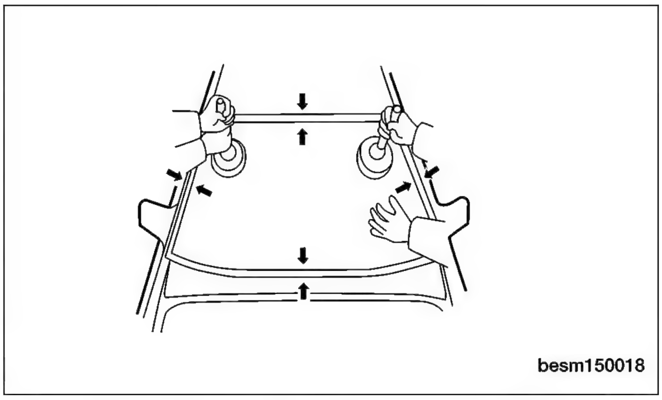
Make sure that the molding is installed within the application period of the bonding agent, and the bonding agent should be mixed within 5 minutes.

10. Applying the bonding agent:
    - Cut off the pot tip and fill the bonding agent into the pot.
    - Place the pot into the sealant gun.
    - Apply the bonding agent on the glass as shown in the figure.



CAUTION:

Verify that the water resistant piece is adhered to the panel of the body as shown in the figure.



11. To install the glass, align the reference marks on the glass and the body and then lightly press the glass into the body opening.
12. Apply the bonding agent on the edges of the glass with a scraper.
13. Remove any excessive bonding agent with a scraper.
14. Clamp the glass until the bonding agent has hardened.
15. Check for water leakage:
    - Perform the leakage test after the hardening period.
    - Seal any leaks with the proper sealant.
16. Install the rear window molding:
    - Install the rear window outer lower molding on the body and tap it lightly to fasten it.
    - Connect the leads of the rear window defroster.

WIPERS AND WASHERS

Description

The wiper system operates the front and rear wipers. The windshield wiper system includes the following components:

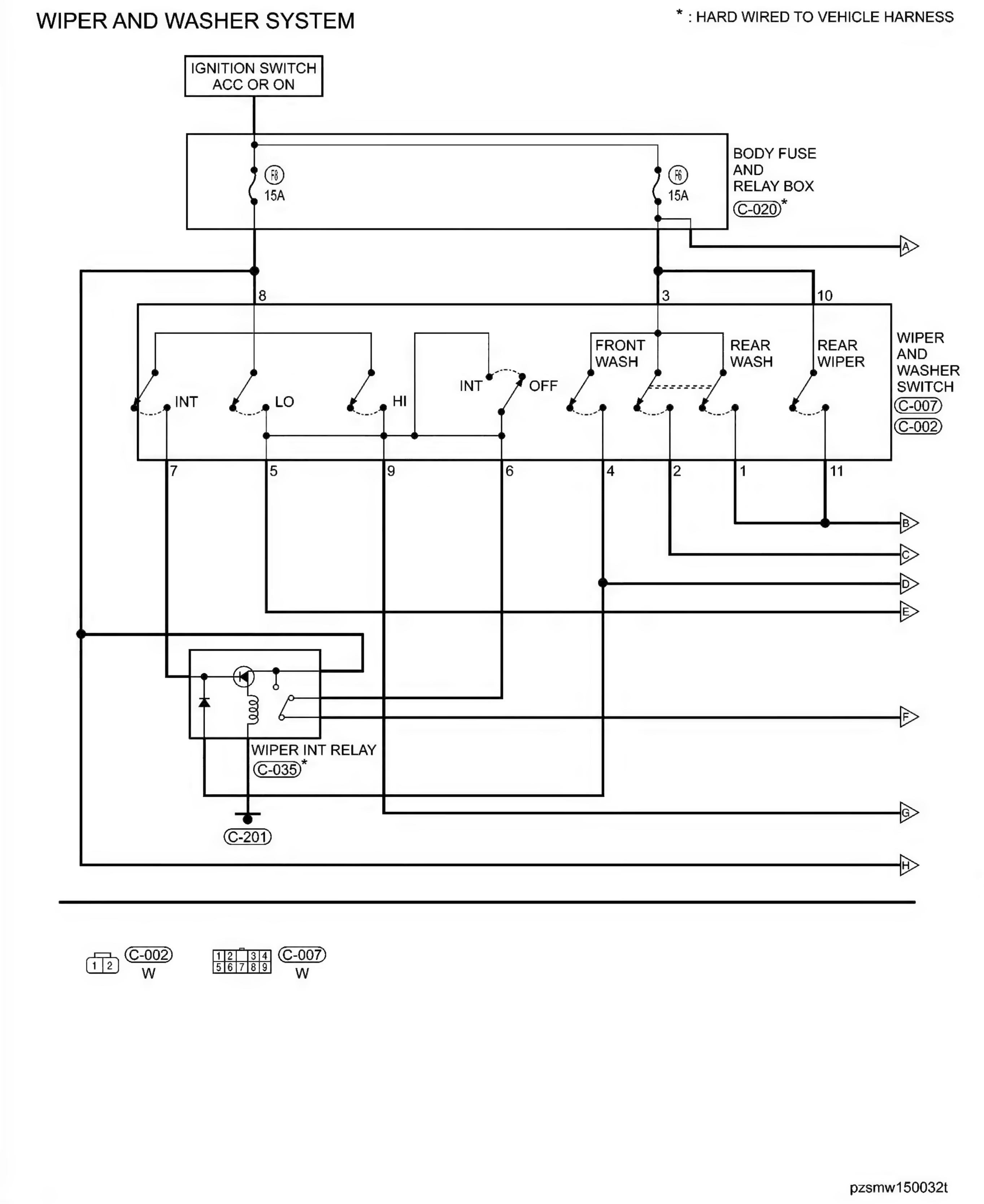
- Wiper and Washer Switch
- Wiper Motor
- Wiper Arm
- Wiper Link
- Washer Bottle
- Washer Motor

Operation

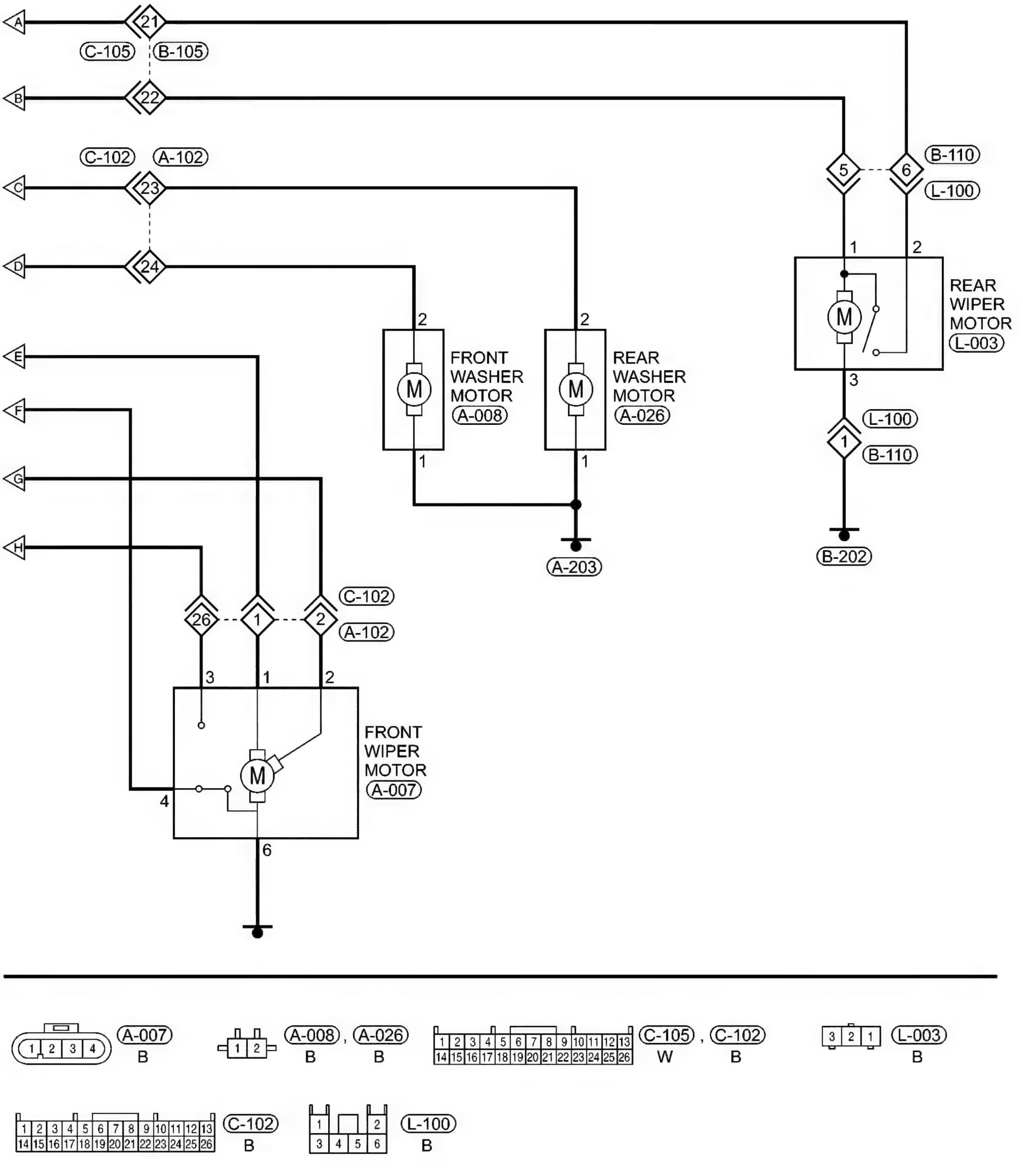
The wiper system is controlled by the wiper and washer switch. The wiper and washer system operate with the ignition switch is in the ON position. All wiper and washer functions are controlled by rotating the control knob on the end of the control stalk to the MIST, OFF, INT, LO or HI wiper positions.

Electrical Schematics

Wiper and Washer System (Page 1 of 2)


WIPER AND WASHER SYSTEM
* : HARD WIRED TO VEHICLE HARNESS
IGNITION SWITCH ACC OR ON
F8 15A
F6 15A
BODY FUSE AND RELAY BOX
C-020*
A
8
3
10
INT
LO
HI
INT
OFF
FRONT WASH
REAR WASH
REAR WIPER
WIPER AND WASHER SWITCH
C-007
C-002
7
5
9
6
4
2
1
11
B
C
D
E
WIPER INT RELAY
C-035*
F
C-201
G
H
1 2
C-002
W
1 2 3 4 5 6 7 8 9
C-007
W
pzsmw150032t

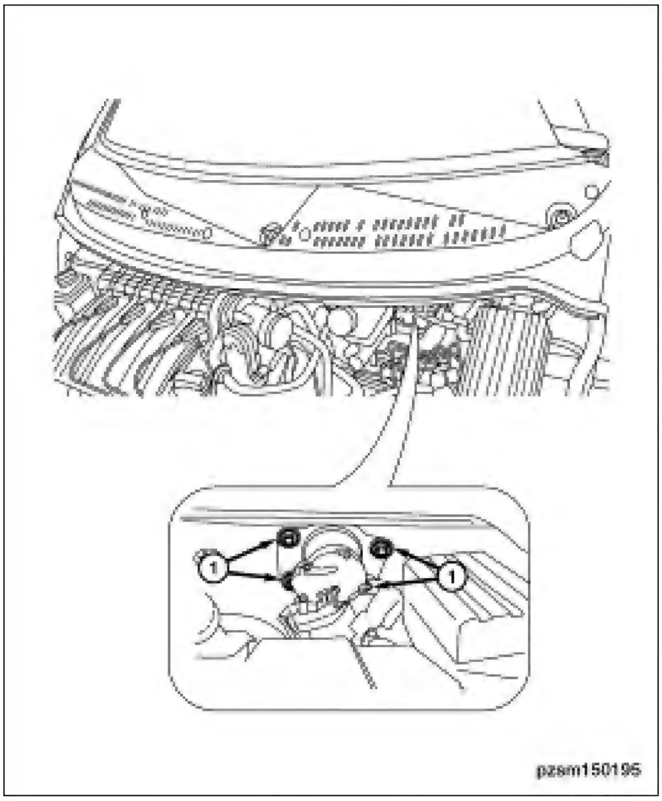
Wiper and Washer System (Page 2 of 2)


A
B
C
D
E
F
G
H
21
22
23
24
C-105
B-105
C-102
A-102
5
6
B-110
L-100
1
2
3
REAR
WIPER
MOTOR
L-003
L-100
B-110
B-202
FRONT
WASHER
MOTOR
A-008
REAR
WASHER
MOTOR
A-026
A-203
26
C-102
A-102
4
6
FRONT
WIPER
MOTOR
A-007
M
A-007
B
A-008 , A-026
B B
C-105 , C-102
W B
L-003
B
C-102
B
L-100
B
pzsmw150036t

Front Wiper Motor

Removal & Installation

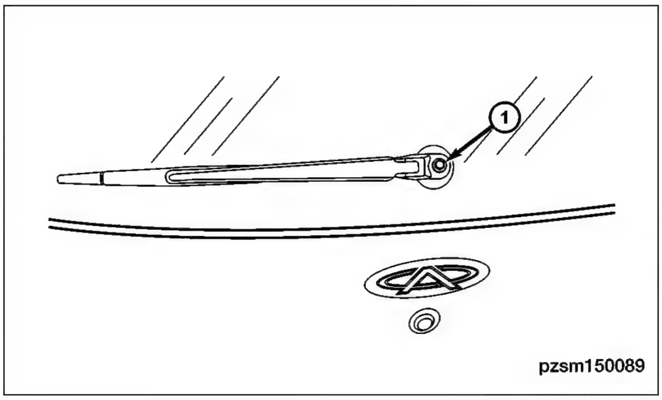
1. Remove the front wiper motor retaining bolts (1).
2. Disconnect the wiper motor electrical connector.
3. Remove the front wiper motor.
4. Installation is in the reverse order of removal.



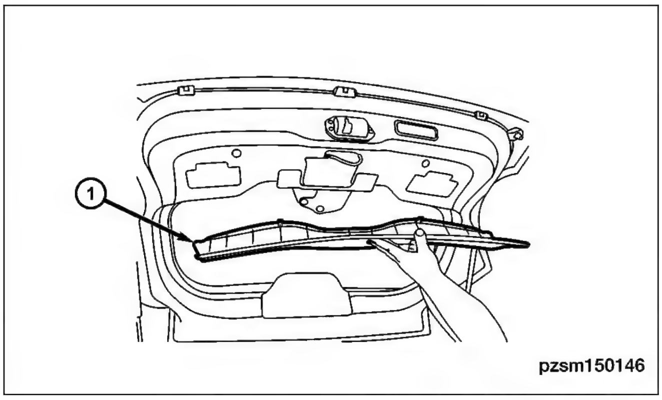
Rear Wiper Motor

Removal & Installation

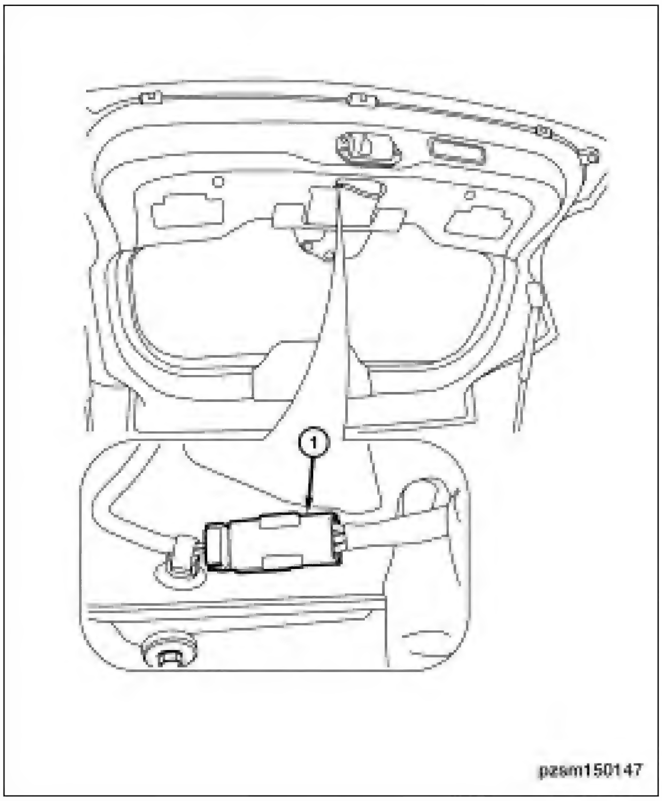
1. Remove the rear wiper arm retaining nut (1).
2. Remove the rear wiper arm.



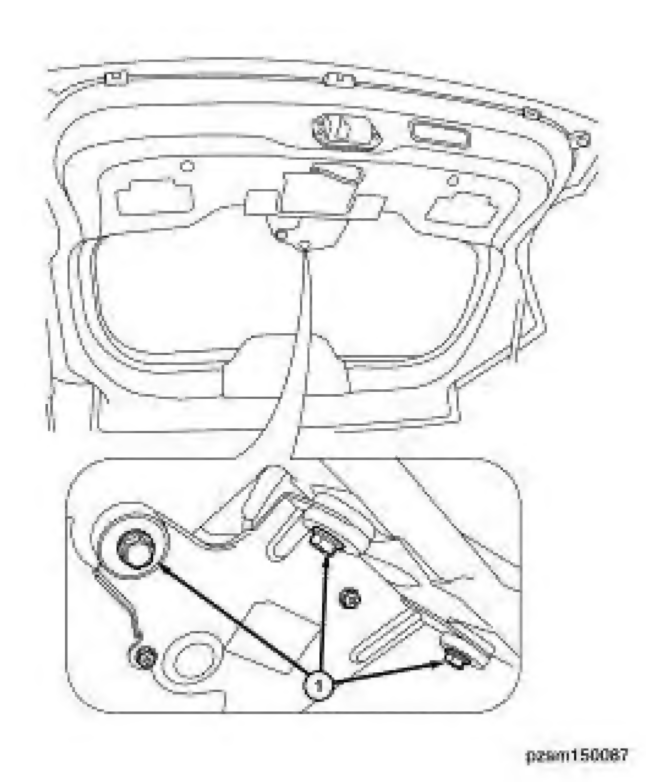
3. Remove the rear hatch trim panel (1).


1
pzsm150146

4. Disconnect the rear wiper motor electrical connector (1).


1
pzsm150147

5. Remove the three rear wiper motor retaining bolts (1).

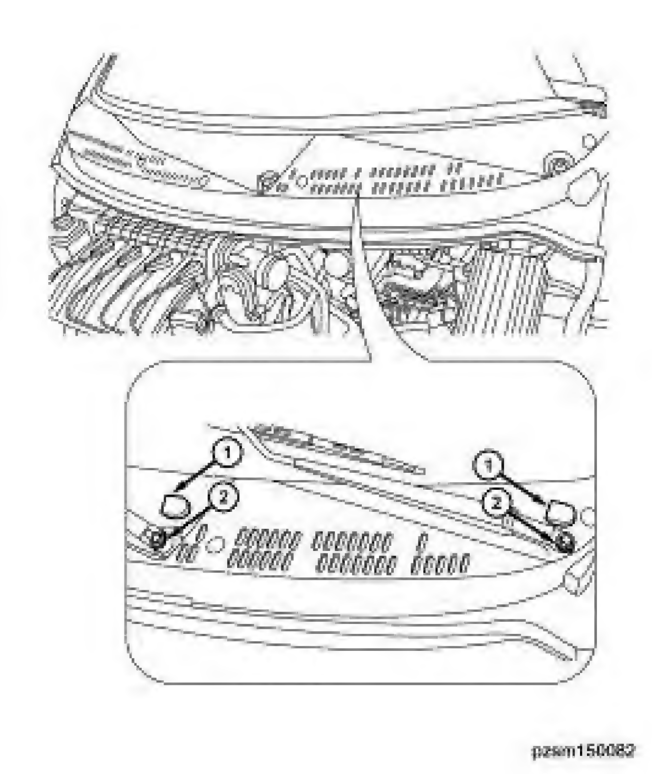


6. Installation is in the reverse order of removal.

Front Wiper Arm

Removal & Installation

1. Remove the two protective covers (1) from the wiper arm retaining nuts.
2. Remove the two wiper arm retaining nuts (2).
3. Remove the two wiper arms.

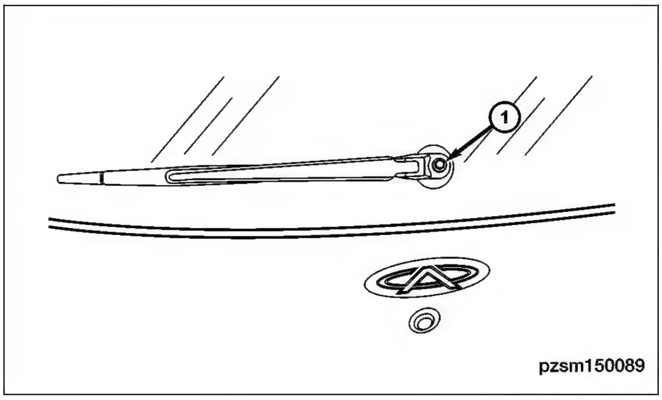


4. Installation is in the reverse order of removal.

Rear Wiper Arm

Removal & Installation

1. Remove the rear wiper arm retaining nut (1).

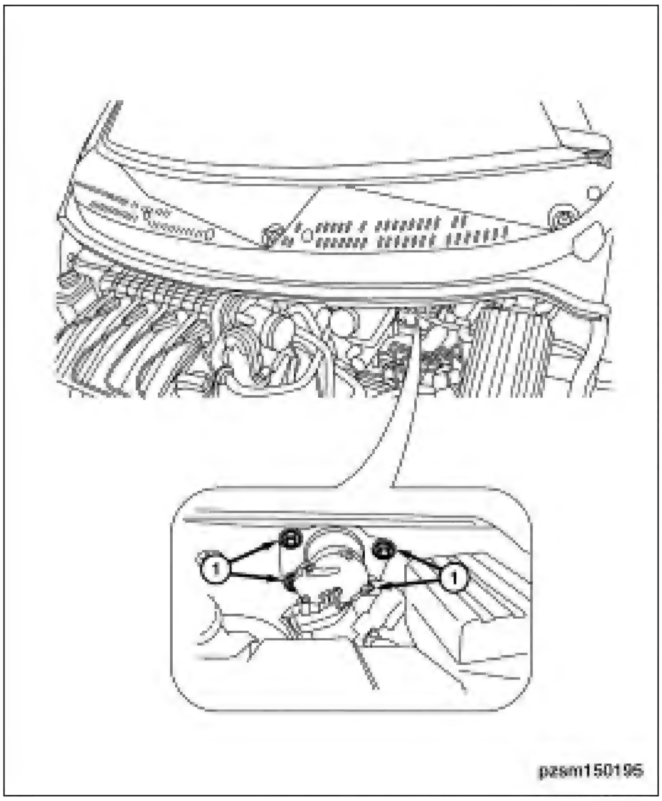


2. Remove the rear wiper arm.
3. Installation is in the reverse order of removal.

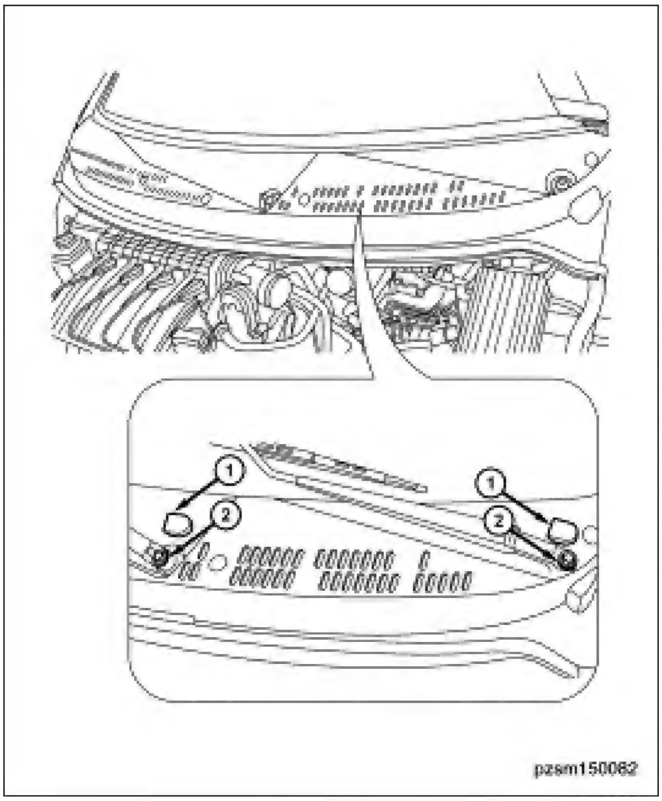
Front Wiper Linkage

Removal & Installation

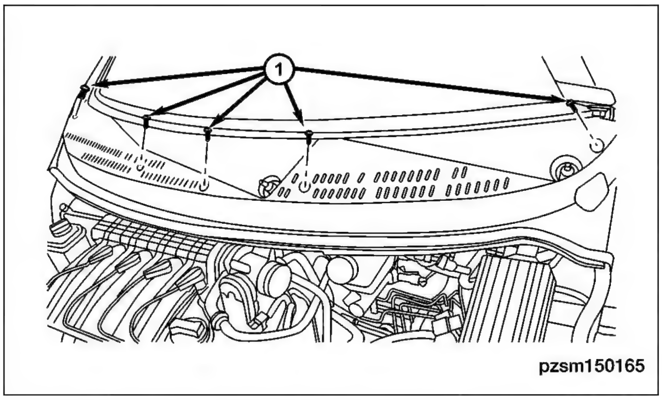
1. Remove the front wiper motor retaining bolts (1).



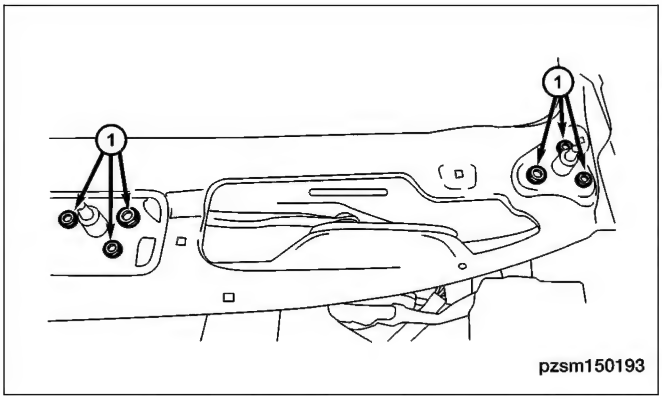
2. Remove the two protective covers (1) from the wiper arm retaining nuts.
3. Remove the two wiper arm retaining nuts (2).
4. Remove the two wiper arms.


1
2
1
2
pzsm150082

5. Remove the lower trim panel retaining screws (1) of front windshield.


1
pzsm150165

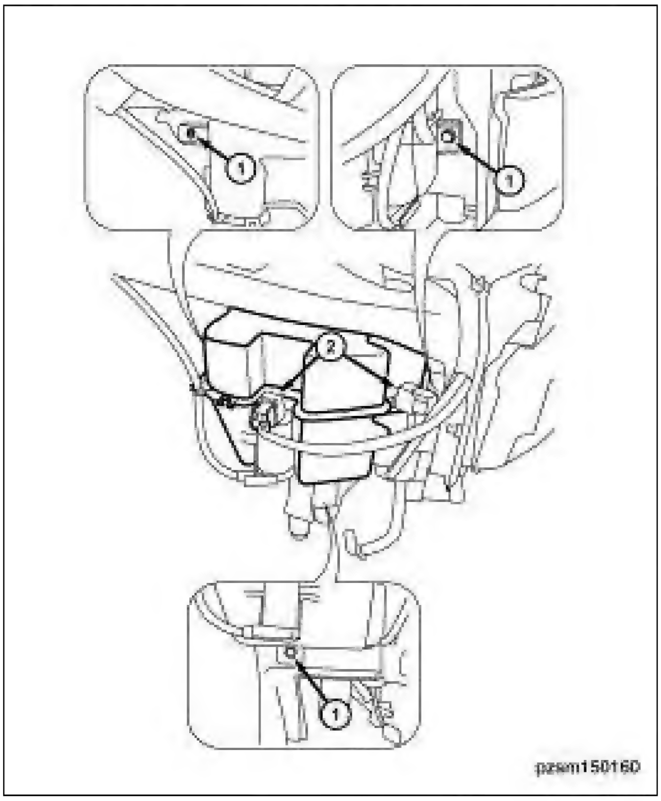
6. Remove the retaining bolts (1) from the linkage.
7. Remove the wiper linkage.
8. Installation is in the reverse order of removal.


1
1
pzsm150193

Washer Bottle & Pump

Removal & Installation

1. Remove the front bumper (See Front Bumper Removal & Installation in Section 15 Body & Accessories).
2. Disconnect the washer hose and the washer pump electrical connector (2).
3. Remove the retaining bolts (1) as shown to remove the washer bottle.

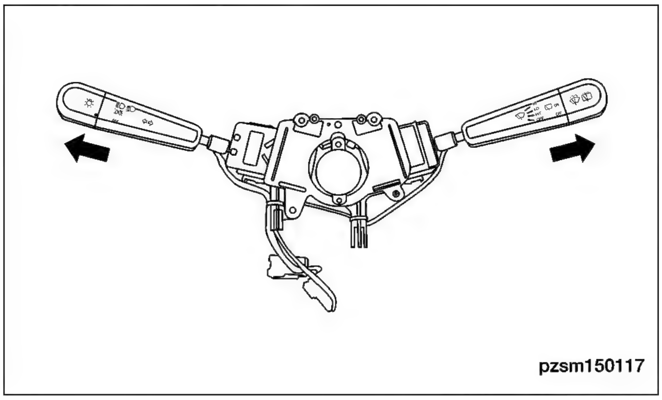


4. Remove the washer bottle.
5. Remove the washer pump.
6. Installation is in the reverse order of removal.

Wiper Switch

Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the steering wheel (See Steering Wheel Removal & Installation in Section 11 Steering).
3. Disconnect the wiper switch electrical connector.
4. Remove the wiper switch.



5. Installation is in the reverse order of removal.

WIRING

16

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Vehicle Ground Distribution 16-21
Vehicle Fuse Box Information 16-28
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WIRING INFORMATION

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GENERAL INFORMATION

Description

The wiring information includes electrical schematics, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wiring harness components, splices and grounds.

Electrical Schematics

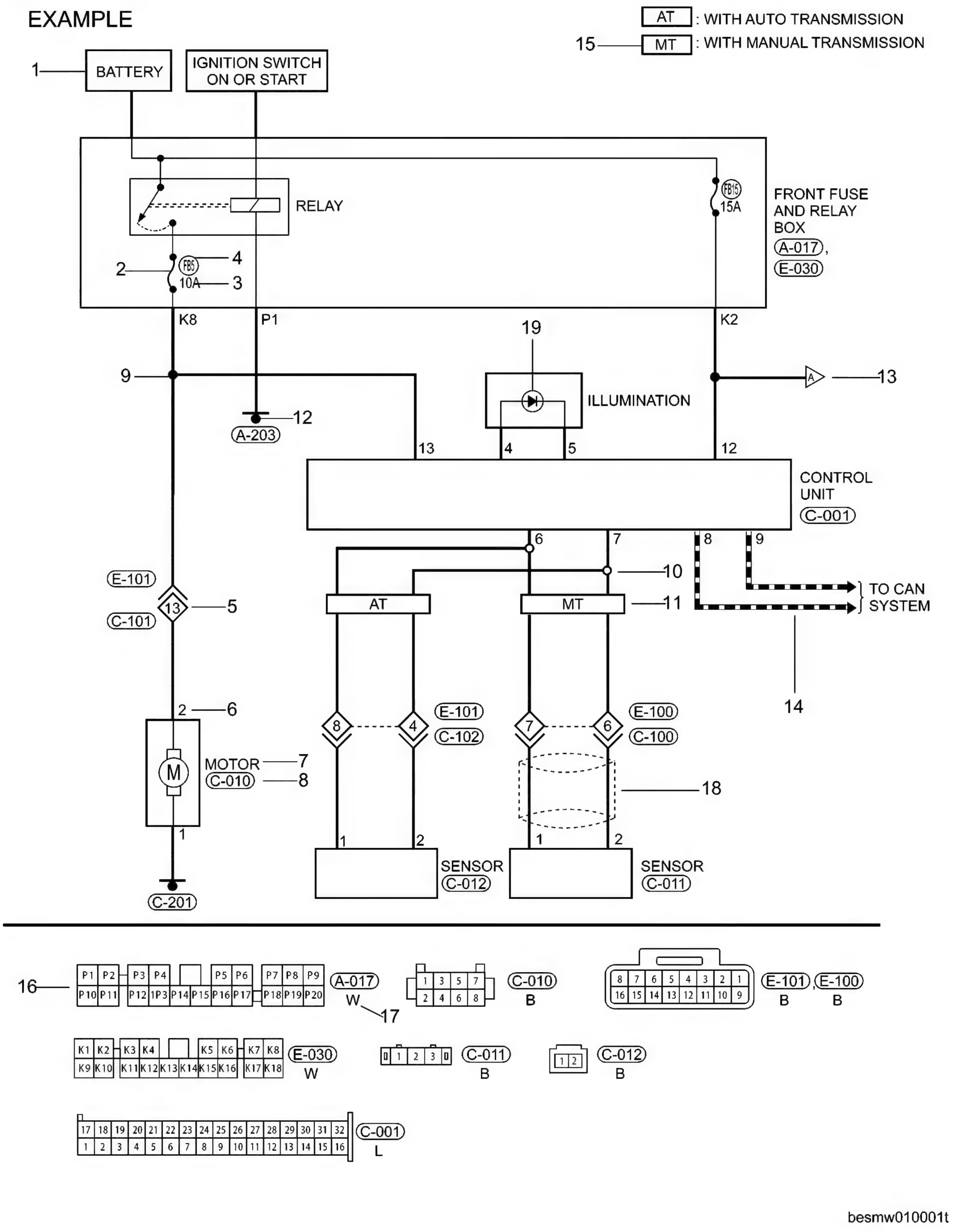
The electrical schematics are grouped into individual service manual chapters. If a component is most likely found in a particular group, it will be shown complete (all wires, connectors, and pins) within that group. For example, the Engine Control Module (ECM) is most likely to be found in Chapter 03 (Electronic Engine Controls), so it is shown there complete. It can, however, be shown partially in another group if it contains some associated wiring.

Chery electrical schematics are designed to provide information regarding the vehicles wiring content. In order to effectively use the electrical schematics to diagnose and repair Chery vehicles, it is important to understand the following features and characteristics:

- Schematics are arranged such that the power (B+) side of the circuit is placed near the top of the page, and the ground (B-) side of the circuit is placed near the bottom of the page.
- All switches, components, and modules are shown in the at rest position with the doors closed and the key removed from the ignition switch.
- Components are shown with a solid line around the component.
- It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one.
- Switches and other components are shown as simply as possible, with regard to function only.

International Symbols

International symbols are used throughout the electrical schematics. These symbols are consistent with those being used around the world. See How to Read Electrical Schematics in Section 01 General Information.


EXAMPLE
AT : WITH AUTO TRANSMISSION
15 MT : WITH MANUAL TRANSMISSION
1 BATTERY
IGNITION SWITCH ON OR START
RELAY
FB15 15A
FRONT FUSE AND RELAY BOX
A-017, E-030
2
FB5 10A
4
3
K8
P1
K2
19
9
12
A-203
13
ILLUMINATION
13
4
5
12
CONTROL UNIT
C-001
6
7
8
9
10
11
AT
MT
TO CAN SYSTEM
14
E-101
13
C-101
5
2 6
MOTOR 7
C-010 8
1
C-201
8
4
E-101
C-102
7
6
E-100
C-100
18
1
2
SENSOR
C-012
1
2
SENSOR
C-011
16
P1 P2 P3 P4 P5 P6 P7 P8 P9
P10 P11 P12 1P3 P14 P15 P16 P17 P18 P19 P20
A-017
W 17
1 3 5 7
2 4 6 8
C-010
B
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
E-101, E-100
B B
K1 K2 K3 K4 K5 K6 K7 K8
K9 K10 K11 K12 K13 K14 K15 K16 K17 K18
E-030
W
1 2 3
C-011
B
1 2
C-012
B
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
C-001
L
besmw010001t

Below is a list of the symbols and their definitions that are used in the electrical schematics.

NUMBER	ITEM	DESCRIPTION
1	Power source	This represents the condition when the system receives battery positive voltage.
2	Fuse	The single line represents that this is a fuse.
3	Current rating	This represents the current rating of the fuse.
4	Fuse location	This represents the location of the fuse in the Power Fuse Box or Front Fuse and Relay Box.
5	Connectors	This represents connector E-101 is female and connector C-101 is male.
6	Terminal number	This represents the terminal number of a connector.
7	Component name	This represents the name of a component.
8	Connector number	This represents the connector number. The letter represents which harness the connector is located in.
9	Splice	The shaded circle represents that the splice is always on the vehicle.
10	Optional splice	The open circle represents that the splice is optional depending on vehicle application.
11	Option abbreviation	This represents that the circuit is optional depending on vehicle application.
12	Ground (GND)	This represents the ground connection. (See Ground Distribution in Section 16 Wiring). Ground connector number has no view face.
13	Page crossing	This arrow represents that the circuit continues to an adjacent page. The ″A″ corresponds with the ″A″ on the adjoining page of the electrical schematic.
14	Data link	This represents that the system branches to another system identified by cell data code.
15	Option description	This represents a description of the option abbreviation used on the page.
16	Connector views	This represents the connector information. This component side is described by the connector symbols.
17	Connector color	This shows a code for the color of the connector: B = Black W = White R = Red G = Green L = Blue Y = Yellow BR = Brown O = Orange GR = Gray
18	Shielded line	The line enclosed by broken line circle represents shielded wire.
19	Light-emitting diodes	As an illumination tool, in the circuit and instrument cluster.

ELECTRICAL TROUBLESHOOTING

Troubleshooting Wiring Problems

When troubleshooting wiring problems there are six steps which can aid in the procedure. The steps are listed and explained below. Always check for non-factory equipped components added to the vehicle before doing any diagnosis. If the vehicle is equipped with these items, disconnect them to verify these add-on items are not the cause of the problem.

Perform the following when troubleshooting a wiring problem:

1. Verify the problem.
2. Verify any related symptoms (do this by performing operational checks on components that are in the same circuit).
3. Analyze the symptoms (use the electrical schematics to determine what the circuit is doing, where the problem most likely is occurring and where the diagnosis will continue).
4. Isolate the problem area.
5. Repair the problem area.
6. Verify the proper operation (for this step, check for proper operation of all items on the repaired circuit).

Testing For Voltage

1. Connect the ground lead of a voltmeter to a known good ground.
2. Connect the other lead of the voltmeter to the selected test point. The vehicle ignition may need to be turned ON to check voltage. Refer to the appropriate test procedure.

Testing For Continuity

1. Remove the fuse for the circuit being checked or, disconnect the battery.
2. Connect one lead of the ohmmeter to one side of the circuit being tested.
3. Connect the other lead to the other end of the circuit being tested (low or no resistance means good continuity).

Testing For A Short To Ground

1. Remove the fuse and disconnect all items involved with the fuse.
2. Connect a test light or a voltmeter across the terminals of the fuse.
3. Starting at the fuse block, wiggle the wiring harness about six to eight inches apart and watch the voltmeter/test light.
4. If the voltmeter registers voltage or the test light glows, there is a short to ground in that general area of the wiring harness.

Intermittent and Poor Connections

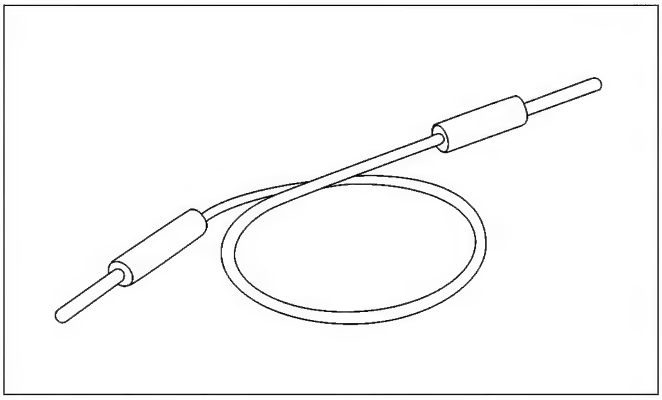
Most intermittent electrical problems are caused by faulty electrical connections or wiring. It is also possible for a sticking component or relay to cause a problem. Before condemning a component or wiring assembly, check the following items:

1. Connectors are fully seated
2. Spread terminals, or terminal push out
3. Terminals in the wiring assembly are fully seated into the connector/component and locked into position
4. Dirt or corrosion on the terminals (any amount of corrosion or dirt could cause an intermittent problem)
5. Damaged connector/component casing exposing the item to dirt or moisture
6. Wire insulation that has rubbed through causing a short to ground
7. Some or all of the wiring strands broken inside of the insulation
8. Wiring broken inside of the insulation

ELECTRICAL TROUBLESHOOTING TOOLS

Jumper Wires

- A jumper wire is used to create a temporary circuit. Connect the jumper wire between the terminals of a circuit to bypass a switch.

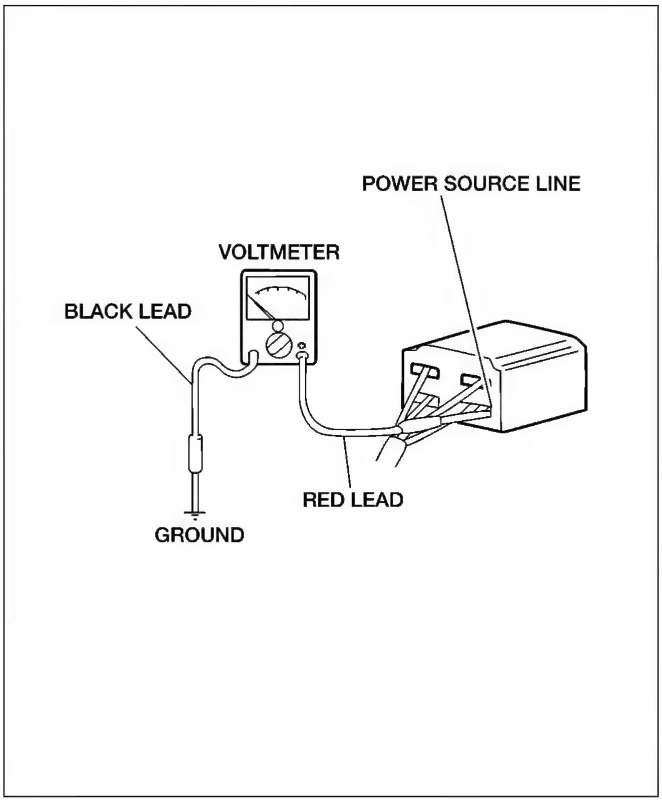


CAUTION:

Do not connect a jumper wire from the power source line to a body ground. This may cause burning or other damage to wiring harnesses or electronic components.

Voltmeter

- The DC voltmeter is used to measure circuit voltage. A voltmeter with a range of 15 V or more is used by connecting the positive (+) probe (red lead wire) to the point where voltage will be measured and the negative (-) probe (black lead wire) to a body ground.

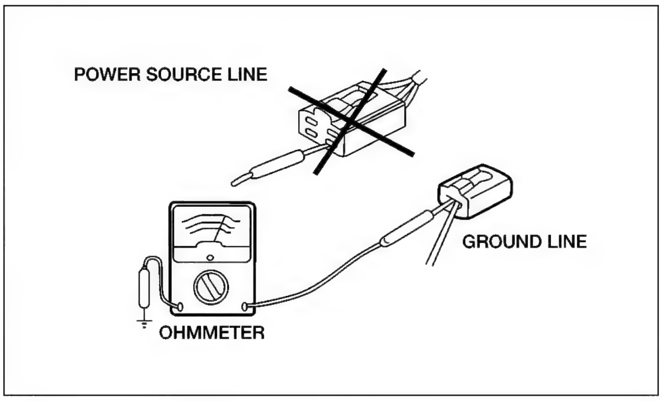


Ohmmeter

- The ohmmeter is used to measure the resistance between two points in a circuit and to check for continuity and short circuits.

CAUTION:

Do not connect the ohmmeter to any circuit where voltage is applied. This will damage the ohmmeter.


POWER SOURCE LINE
GROUND LINE
OHMMETER

ELECTRICAL REPAIR

Wire Repair

NOTE :
When splicing a wire, it is important that the correct gage be used.

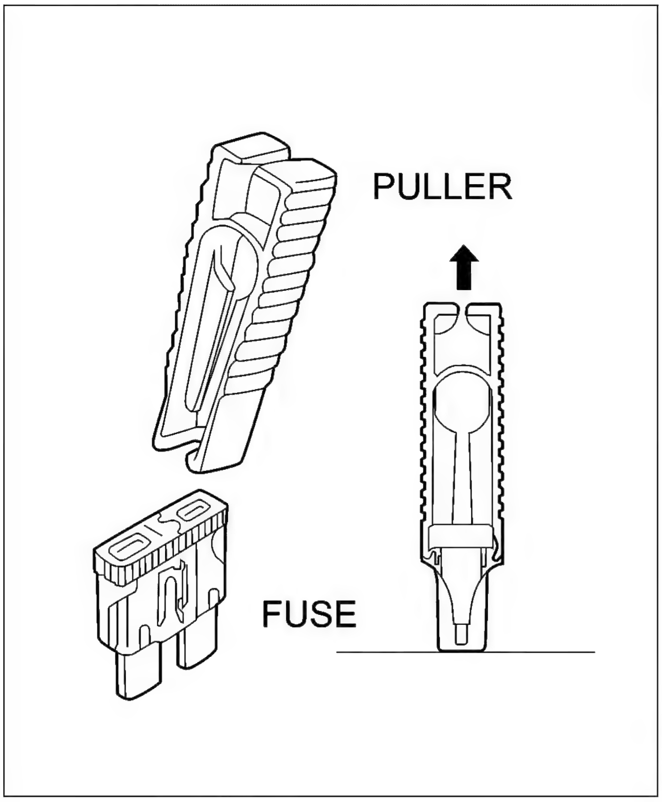
1. Remove one-half (1/2) inch of insulation from each wire that needs to be spliced.
2. Place a piece of adhesive lined heat shrink tubing on one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.
3. Place the strands of wire overlapping each other inside of the splice clip.
4. Using a crimping tool, crimp the splice clip and wires together.

NOTE :
Do not use acid core solder when making wiring repairs.

5. Solder the connection together using a soldering iron and rosin core type solder only.
6. Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing.

Fuse Replacement

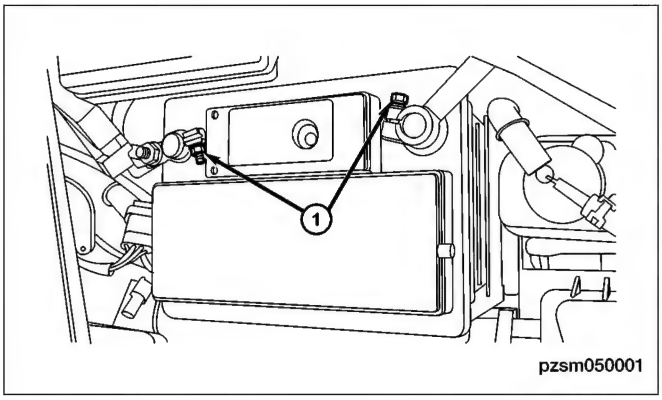
- When replacing a fuse, be sure to replace it with one of the same capacity. If a fuse fails again, the circuit probably has a short and the wiring should be checked.
- Be sure the negative battery terminal is disconnected before replacing a main fuse.
- When replacing a pullout fuse, use the fuse puller.



ELECTRICAL COMPONENTS

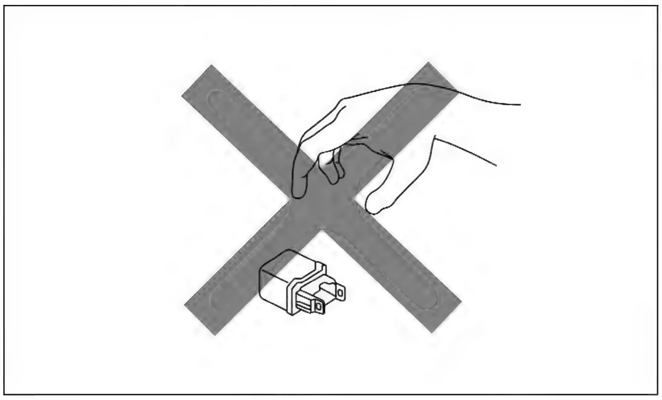
Battery Cable

- Before disconnecting connectors or removing electrical parts, disconnect the negative battery cable.



Sensors, Switches, and Relays

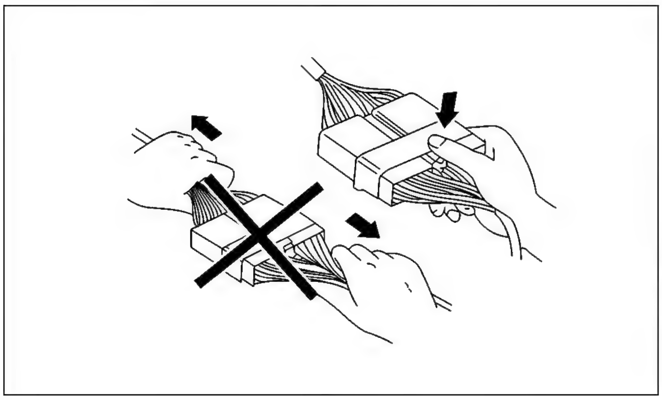
- Handle sensors, switches and relays carefully. Do not drop them or strike them against other objects.



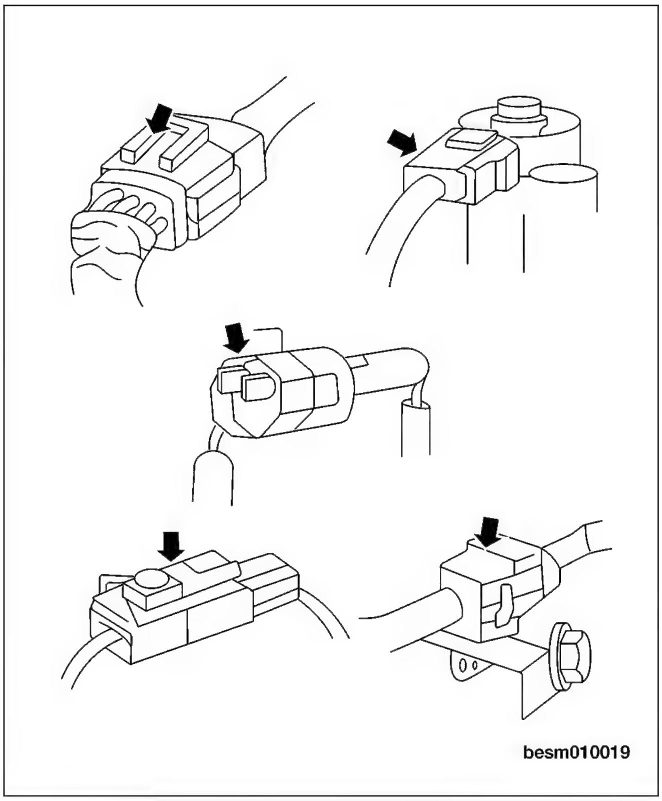
Connectors

Disconnecting Connectors

- When disconnecting 2 connectors, grasp the connectors, not the wires.

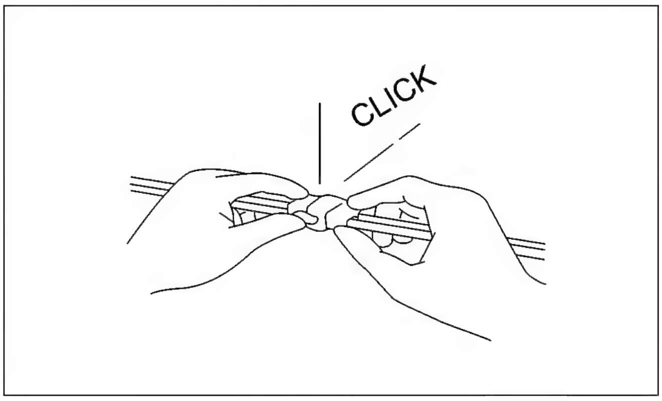


- Connectors can be disconnected by pressing or pulling the lock lever as shown.



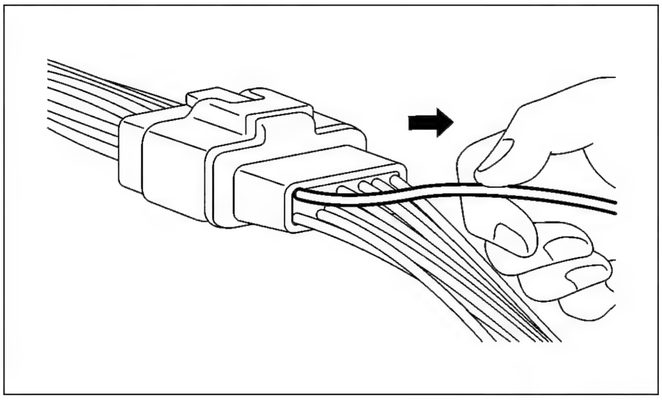
Locking Connector

- When locking connectors, listen for a click indicating they are securely locked.



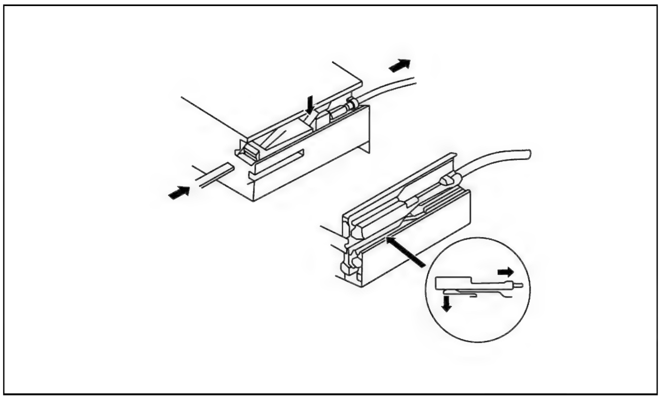
Connector Terminals

- Pull lightly on individual wires to check that they are secured in the terminal.



Connector/Terminal Replacement

- Use the appropriate tools to remove a terminal as shown. While installing a terminal, be sure to insert it until it locks securely.
- Insert a thin piece of metal from the terminal side of the connector and with the terminal locking tab pressed down, pull the terminal out from the connector.



VEHICLE POWER DISTRIBUTION

GENERAL INFORMATION 16-13
- Description 16-13
- Operation 16-13

ELECTRICAL SCHEMATICS 16-14
- Electrical Schematics 16-14

GENERAL INFORMATION

Description

The power distribution system is designed to provide safe, reliable, centralized and convenient access to the distribution of the electrical power required to operate all vehicle electrical and electronic systems.

The following components are used for power distribution:

- Battery
- Body Fuse and Relay Box
- Front Fuse and Relay Box
- Ignition Switch
- Fuses
- Circuit Breakers
- Relays

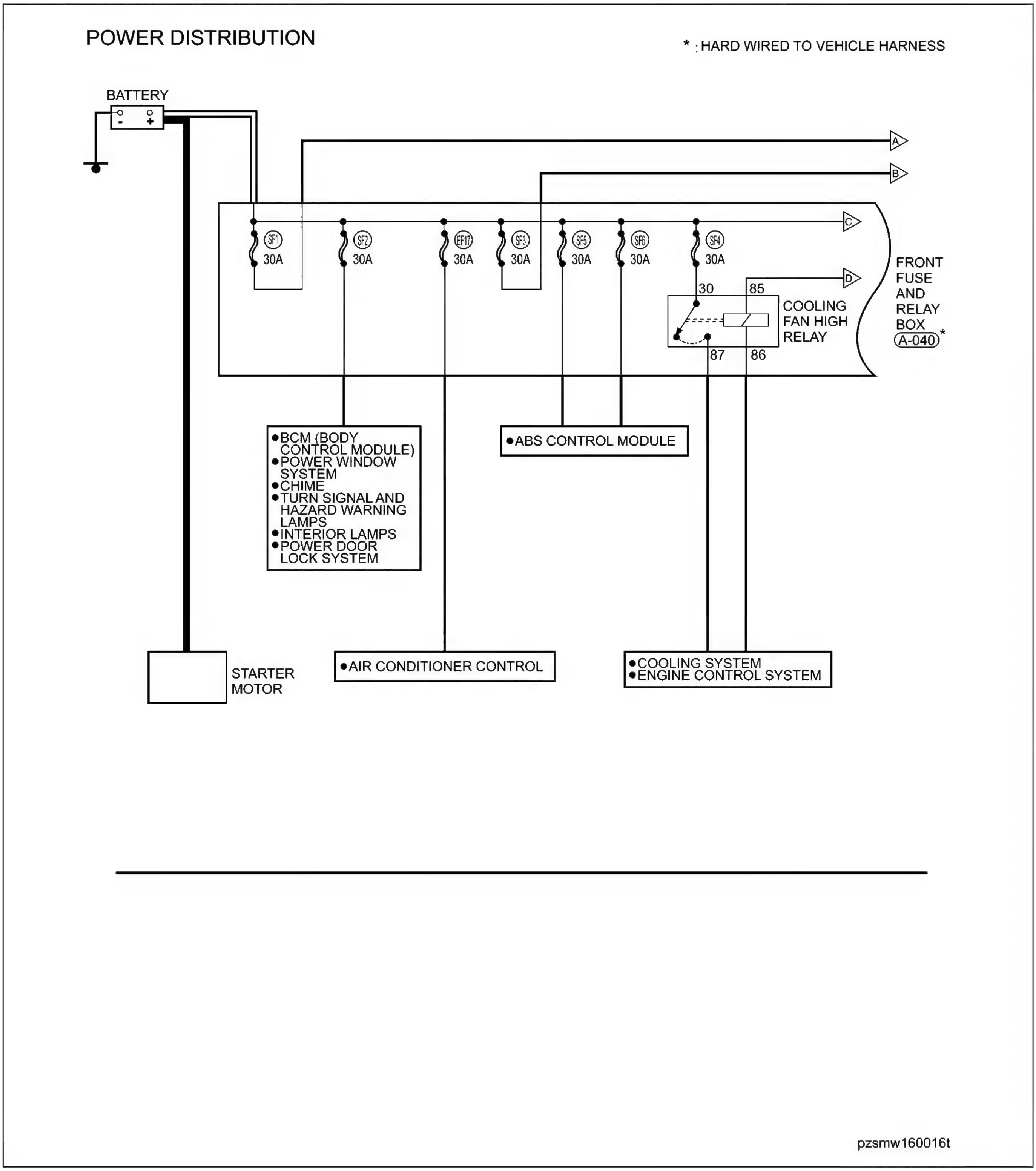
Operation

The power distribution system operates all electrical and electronic engine, transmission, chassis, safety, comfort and convenience systems.

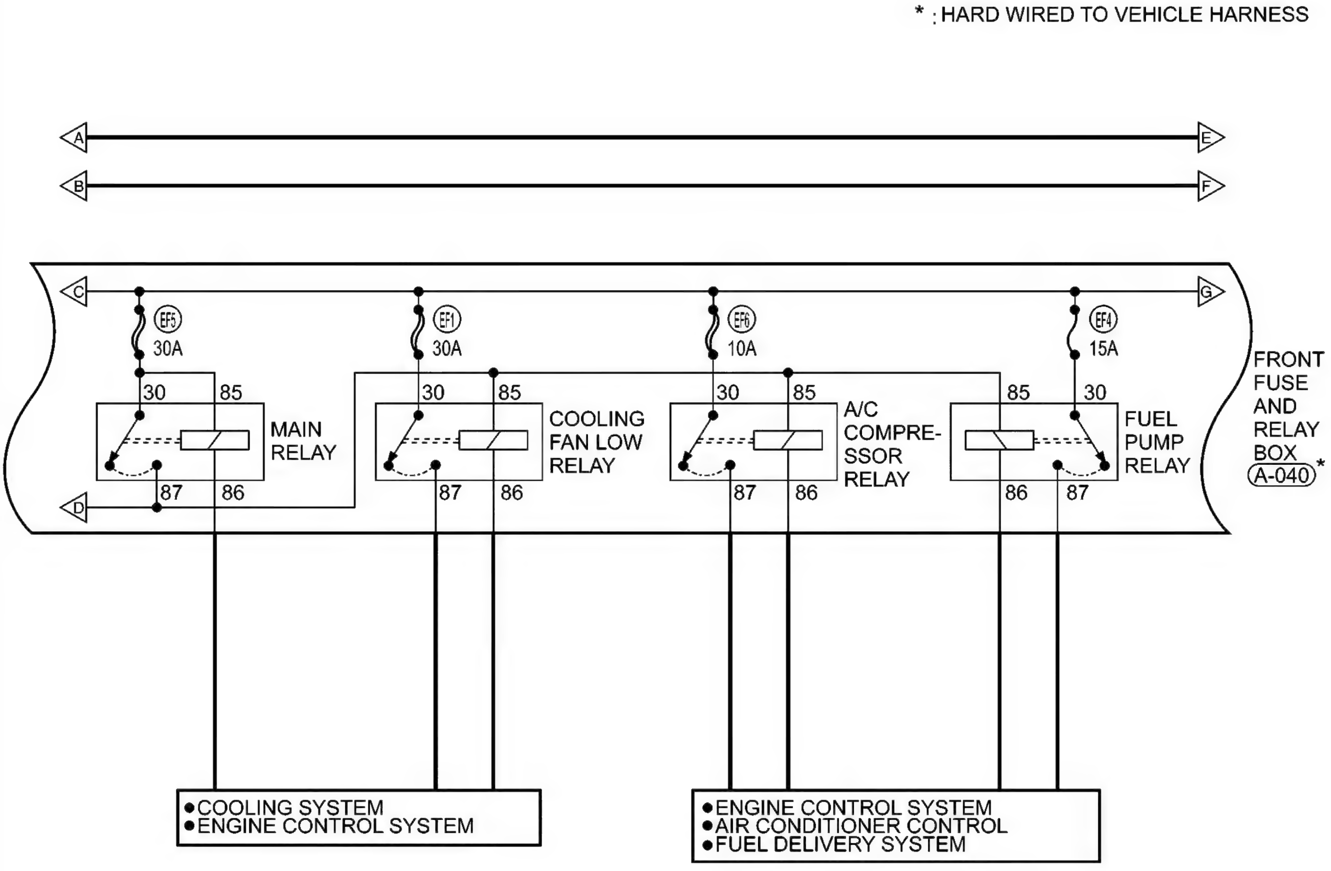
Electrical Schematics

The power distribution electrical schematics include all wiring information detailed on the power side of all vehicle circuits. This is helpful when attempting to troubleshoot a specific electrical failure, and shows connector pin-out information and splices.

Power Distribution (Page 1 of 7)

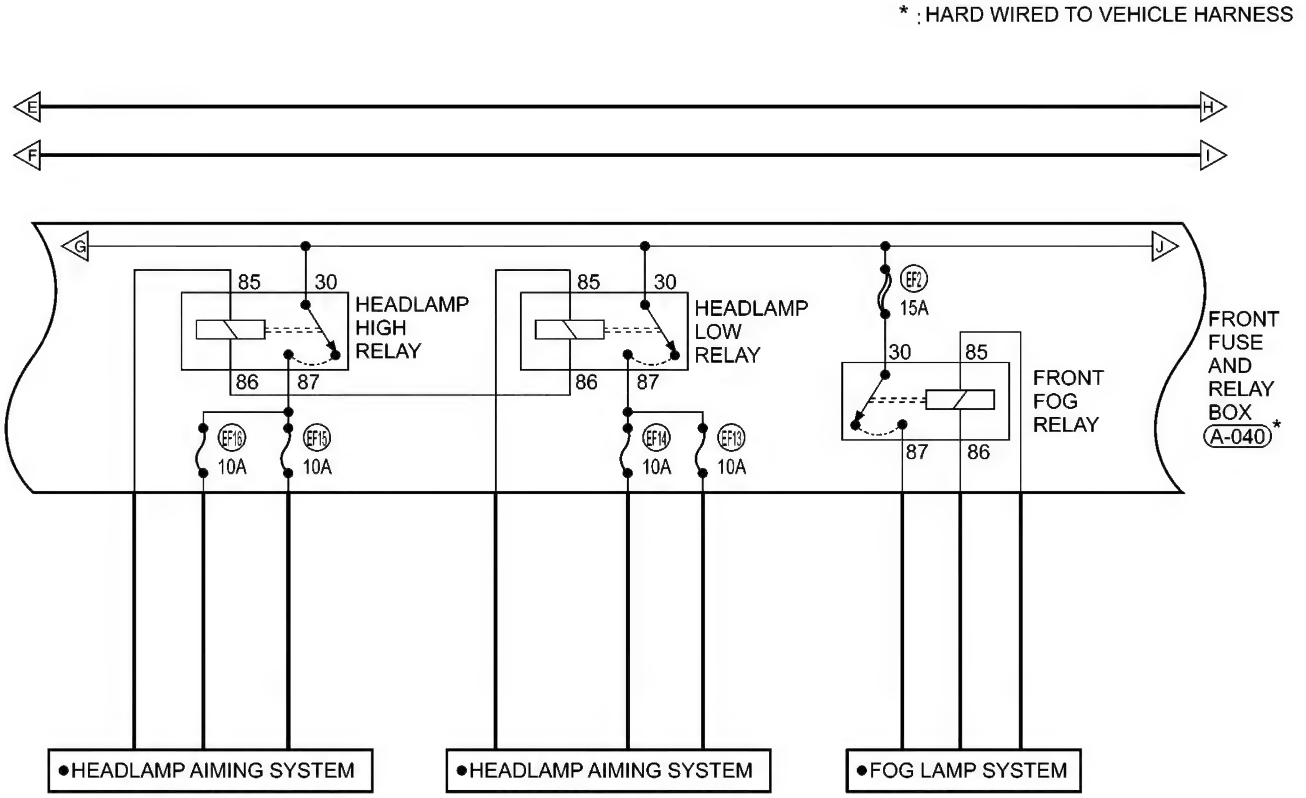

POWER DISTRIBUTION
* : HARD WIRED TO VEHICLE HARNESS
BATTERY
- +
A
B
C
D
SF1 30A
SF2 30A
EF17 30A
SF3 30A
SF5 30A
SF6 30A
SF4 30A
30
85
87
86
COOLING FAN HIGH RELAY
FRONT FUSE AND RELAY BOX
A-040 *
●BCM (BODY CONTROL MODULE)
●POWER WINDOW SYSTEM
●CHIME
●TURN SIGNAL AND HAZARD WARNING LAMPS
●INTERIOR LAMPS
●POWER DOOR LOCK SYSTEM
●ABS CONTROL MODULE
STARTER MOTOR
●AIR CONDITIONER CONTROL
●COOLING SYSTEM
●ENGINE CONTROL SYSTEM
pzsmw160016t

Power Distribution (Page 2 of 7)


* : HARD WIRED TO VEHICLE HARNESS
A
B
C
D
E
F
G
EF5
30A
EF1
30A
EF6
10A
EF4
15A
30
85
87
86
MAIN RELAY
COOLING FAN LOW RELAY
A/C COMPRE-SSOR RELAY
FUEL PUMP RELAY
FRONT FUSE AND RELAY BOX
A-040 *
●COOLING SYSTEM
●ENGINE CONTROL SYSTEM
●ENGINE CONTROL SYSTEM
●AIR CONDITIONER CONTROL
●FUEL DELIVERY SYSTEM

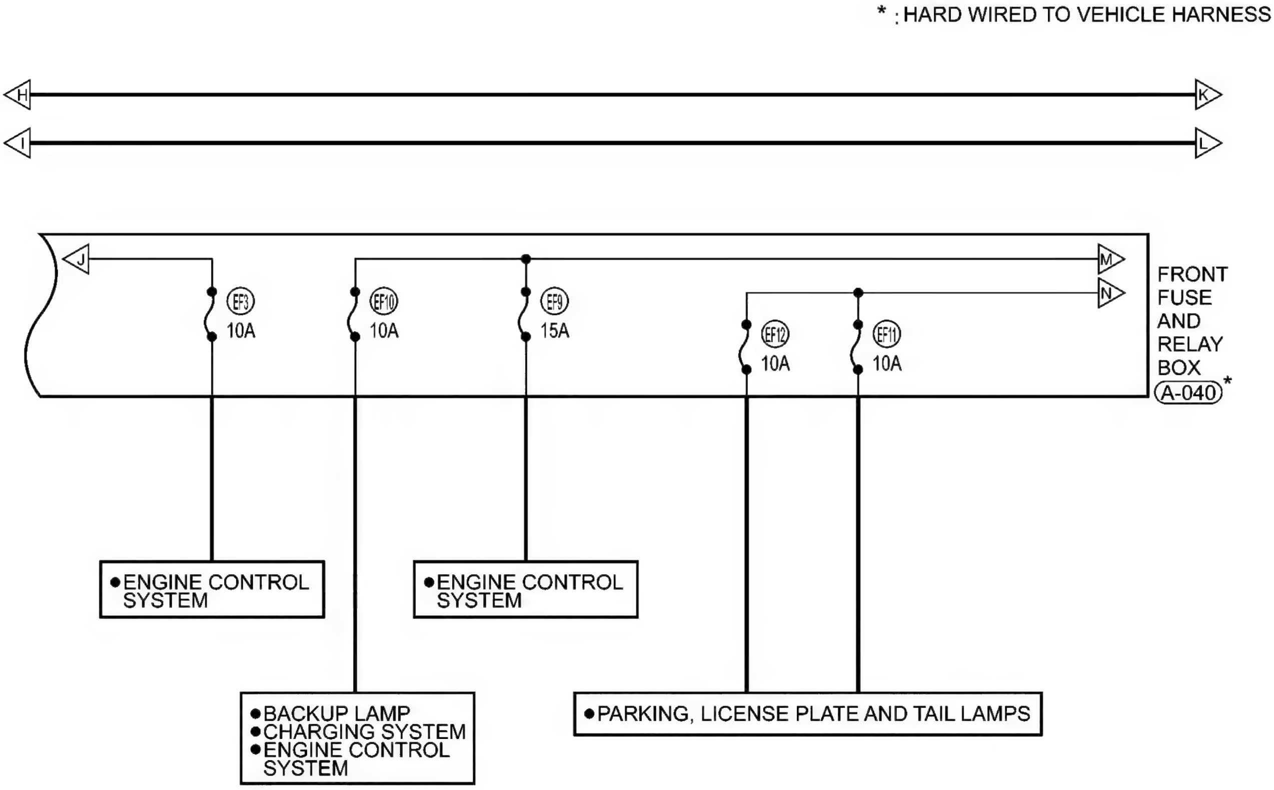
pzsmw160017t

Power Distribution (Page 3 of 7)


* : HARD WIRED TO VEHICLE HARNESS
E
H
F
I
G
J
85
30
HEADLAMP HIGH RELAY
86
87
EF16
10A
EF15
10A
85
30
HEADLAMP LOW RELAY
86
87
EF14
10A
EF13
10A
EF2
15A
30
85
FRONT FOG RELAY
87
86
FRONT FUSE AND RELAY BOX
A-040 *
●HEADLAMP AIMING SYSTEM
●HEADLAMP AIMING SYSTEM
●FOG LAMP SYSTEM

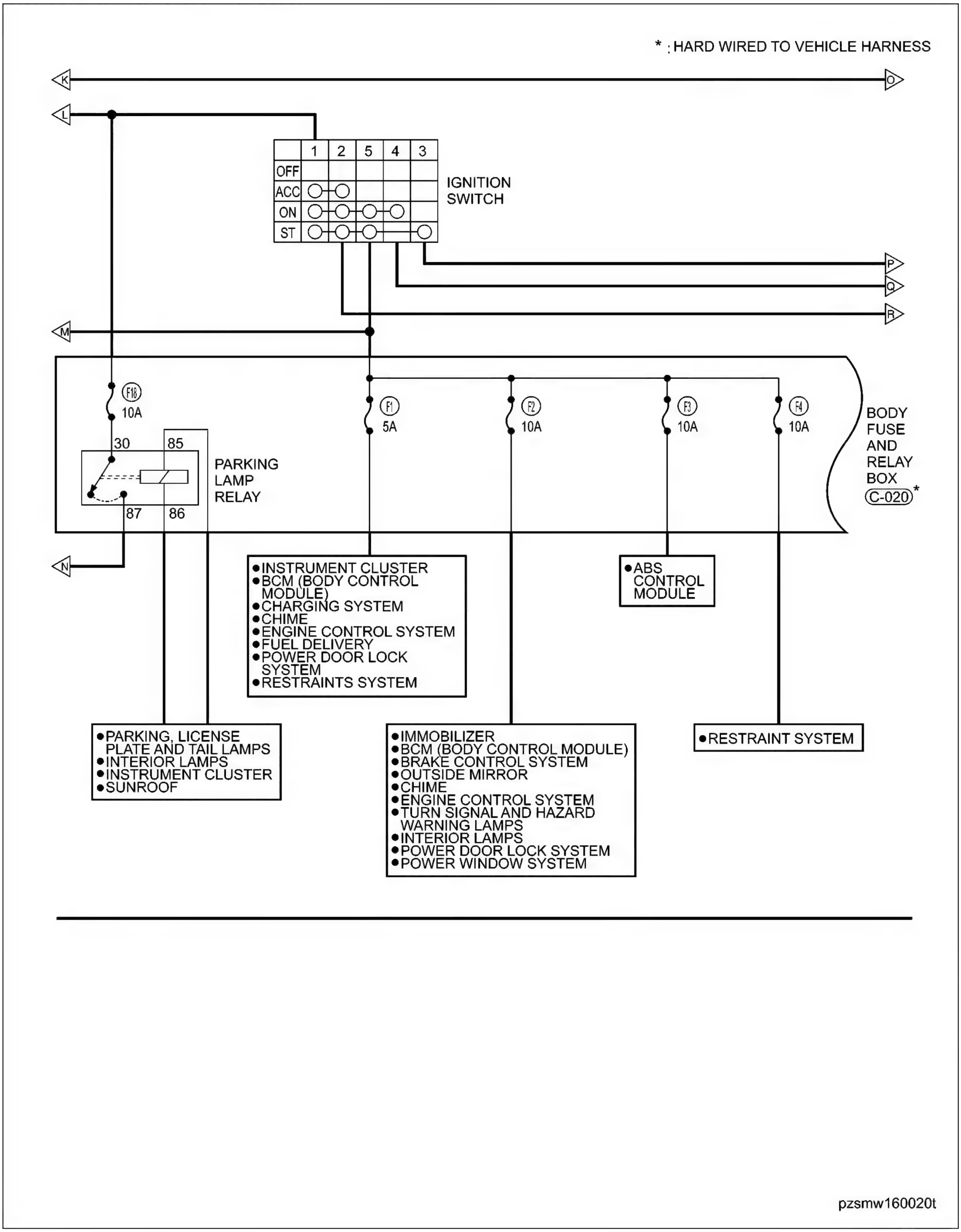
pzsmw160018t

Power Distribution (Page 4 of 7)

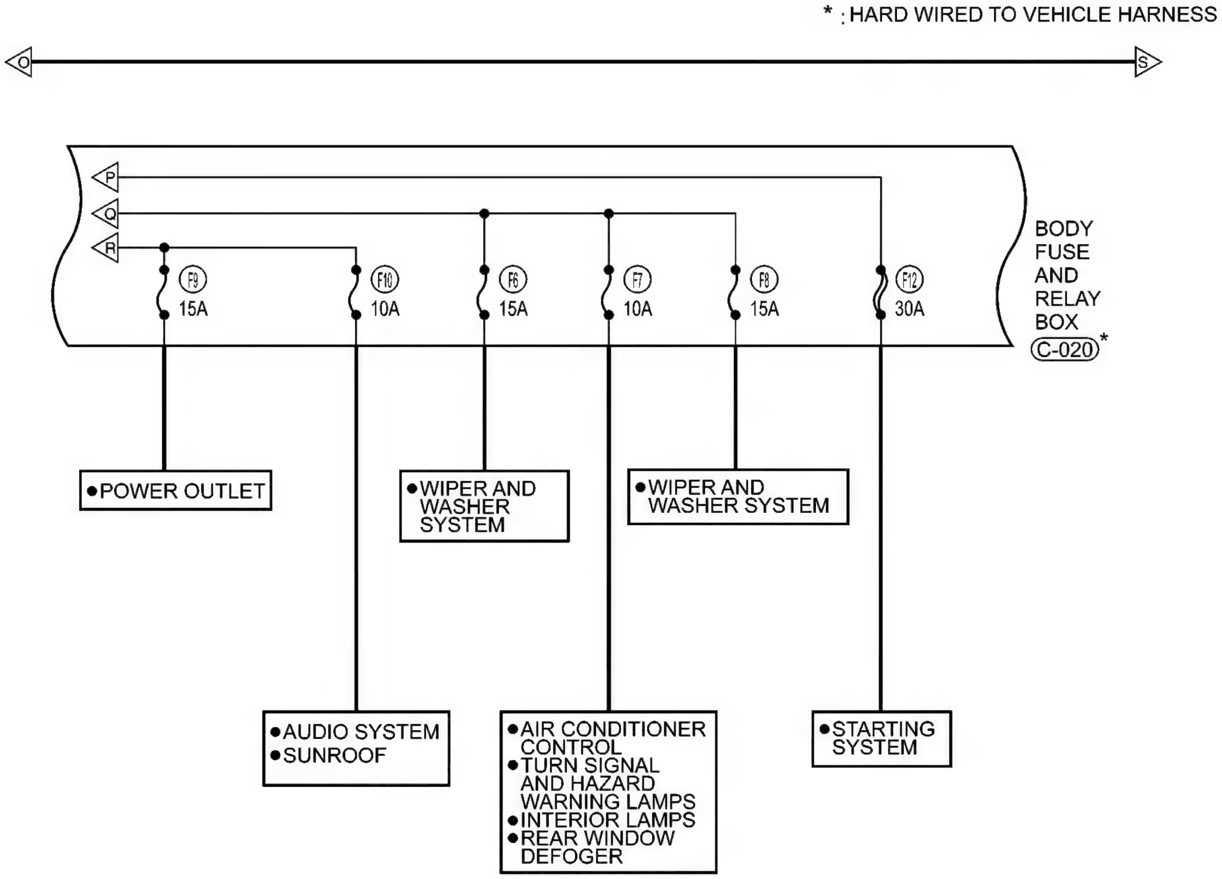

* : HARD WIRED TO VEHICLE HARNESS
H
K
I
L
J
M
N
EF3
10A
EF10
10A
EF9
15A
EF12
10A
EF11
10A
FRONT FUSE AND RELAY BOX
A-040 *
● ENGINE CONTROL SYSTEM
● ENGINE CONTROL SYSTEM
● BACKUP LAMP
● CHARGING SYSTEM
● ENGINE CONTROL SYSTEM
● PARKING, LICENSE PLATE AND TAIL LAMPS

pzsmw160019t

Power Distribution (Page 5 of 7)

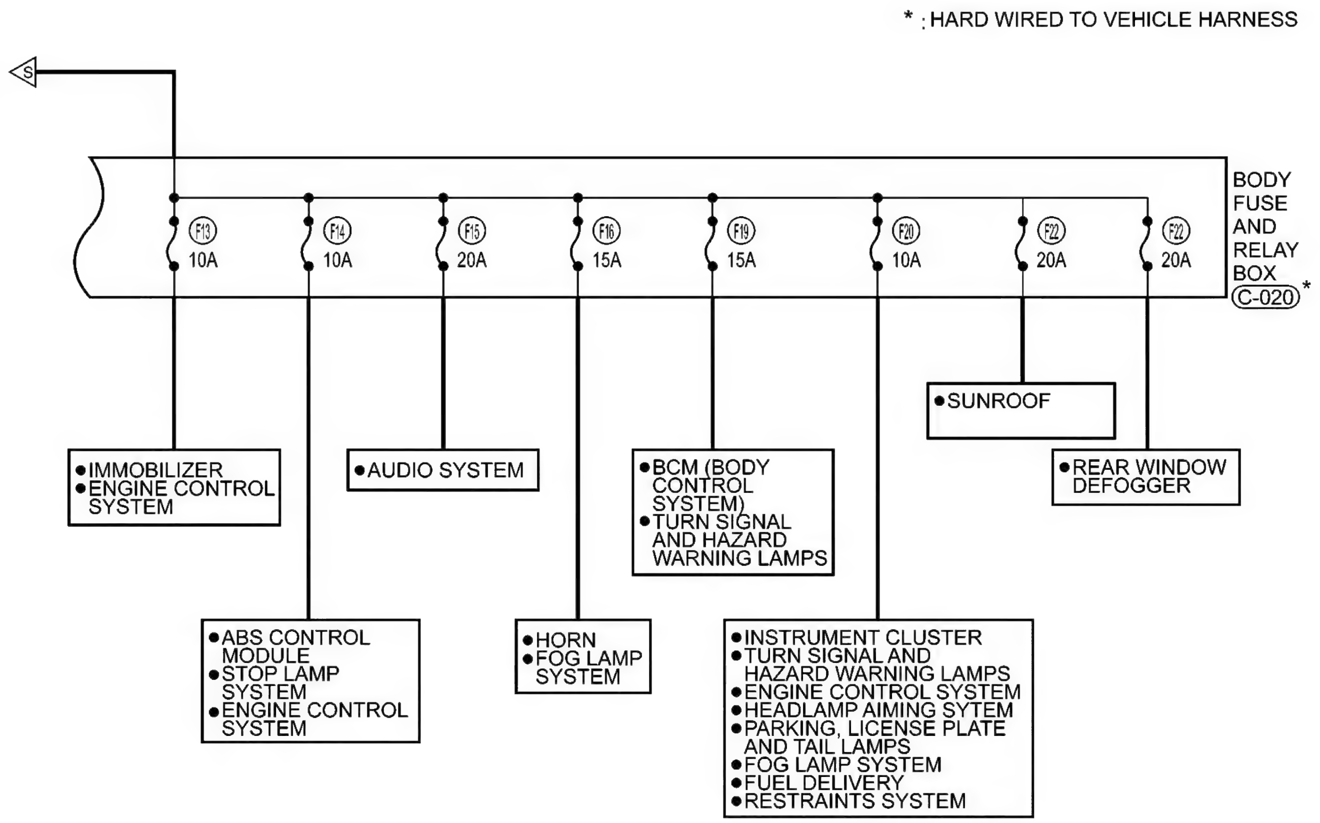

* : HARD WIRED TO VEHICLE HARNESS
K
O
L
1
2
5
4
3
OFF
ACC
ON
ST
IGNITION SWITCH
P
Q
R
M
F18
10A
30
85
87
86
PARKING LAMP RELAY
F1
5A
F2
10A
F3
10A
F4
10A
BODY FUSE AND RELAY BOX
C-020*
N
●INSTRUMENT CLUSTER
●BCM (BODY CONTROL MODULE)
●CHARGING SYSTEM
●CHIME
●ENGINE CONTROL SYSTEM
●FUEL DELIVERY
●POWER DOOR LOCK SYSTEM
●RESTRAINTS SYSTEM
●ABS CONTROL MODULE
●PARKING, LICENSE PLATE AND TAIL LAMPS
●INTERIOR LAMPS
●INSTRUMENT CLUSTER
●SUNROOF
●IMMOBILIZER
●BCM (BODY CONTROL MODULE)
●BRAKE CONTROL SYSTEM
●OUTSIDE MIRROR
●CHIME
●ENGINE CONTROL SYSTEM
●TURN SIGNAL AND HAZARD WARNING LAMPS
●INTERIOR LAMPS
●POWER DOOR LOCK SYSTEM
●POWER WINDOW SYSTEM
●RESTRAINT SYSTEM
pzsmw160020t

Power Distribution (Page 6 of 7)


* : HARD WIRED TO VEHICLE HARNESS
O
S
P
Q
R
F9
15A
F10
10A
F6
15A
F7
10A
F8
15A
F12
30A
BODY FUSE AND RELAY BOX
C-020 *
●POWER OUTLET
●WIPER AND WASHER SYSTEM
●WIPER AND WASHER SYSTEM
●AUDIO SYSTEM
●SUNROOF
●AIR CONDITIONER CONTROL
●TURN SIGNAL AND HAZARD WARNING LAMPS
●INTERIOR LAMPS
●REAR WINDOW DEFOGER
●STARTING SYSTEM

pzsmw160021t

Power Distribution (Page 7 of 7)



* : HARD WIRED TO VEHICLE HARNESS
S
BODY FUSE AND RELAY BOX
C-020 *
F13 10A
F14 10A
F15 20A
F16 15A
F19 15A
F20 10A
F22 20A
F22 20A
●IMMOBILIZER
●ENGINE CONTROL SYSTEM
●AUDIO SYSTEM
●BCM (BODY CONTROL SYSTEM)
●TURN SIGNAL AND HAZARD WARNING LAMPS
●SUNROOF
●REAR WINDOW DEFOGGER
●ABS CONTROL MODULE
●STOP LAMP SYSTEM
●ENGINE CONTROL SYSTEM
●HORN
●FOG LAMP SYSTEM
●INSTRUMENT CLUSTER
●TURN SIGNAL AND HAZARD WARNING LAMPS
●ENGINE CONTROL SYSTEM
●HEADLAMP AIMING SYTEM
●PARKING, LICENSE PLATE AND TAIL LAMPS
●FOG LAMP SYSTEM
●FUEL DELIVERY
●RESTRAINTS SYSTEM

pzsmw160022t

VEHICLE GROUND DISTRIBUTION

GENERAL INFORMATION 16-22
Description 16-22
Operation 16-22
ELECTRICAL SCHEMATICS 16-23
Electrical Schematics 16-23

GENERAL INFORMATION

Description

The ground distribution system is designed to provide centralized and convenient ground locations for the entire vehicle electrical system.

Operation

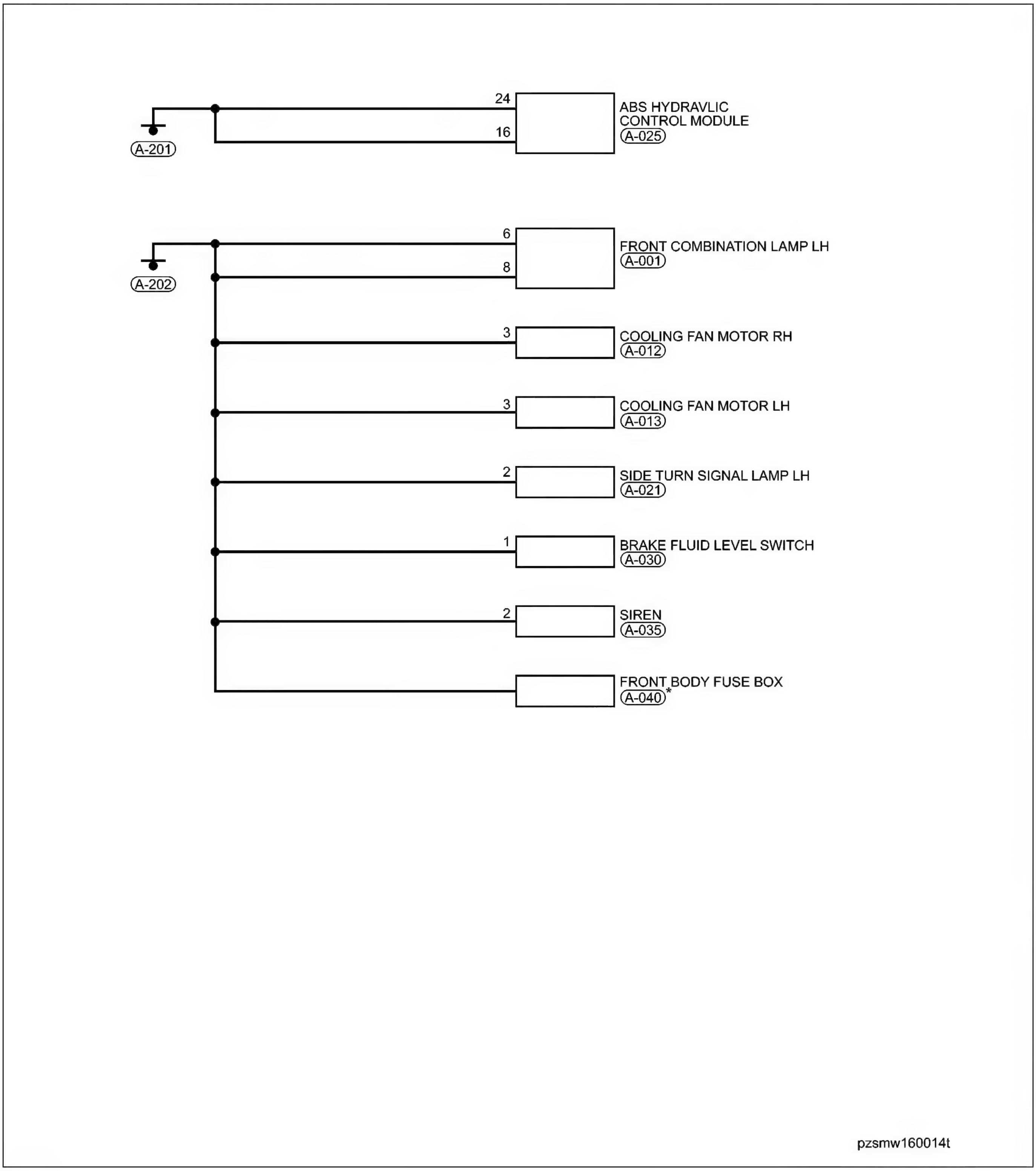
The ground distribution system provides a grounding path for all electrical and electronic engine, transmission, chassis, safety, comfort and convenience systems.

ELECTRICAL SCHEMATICS

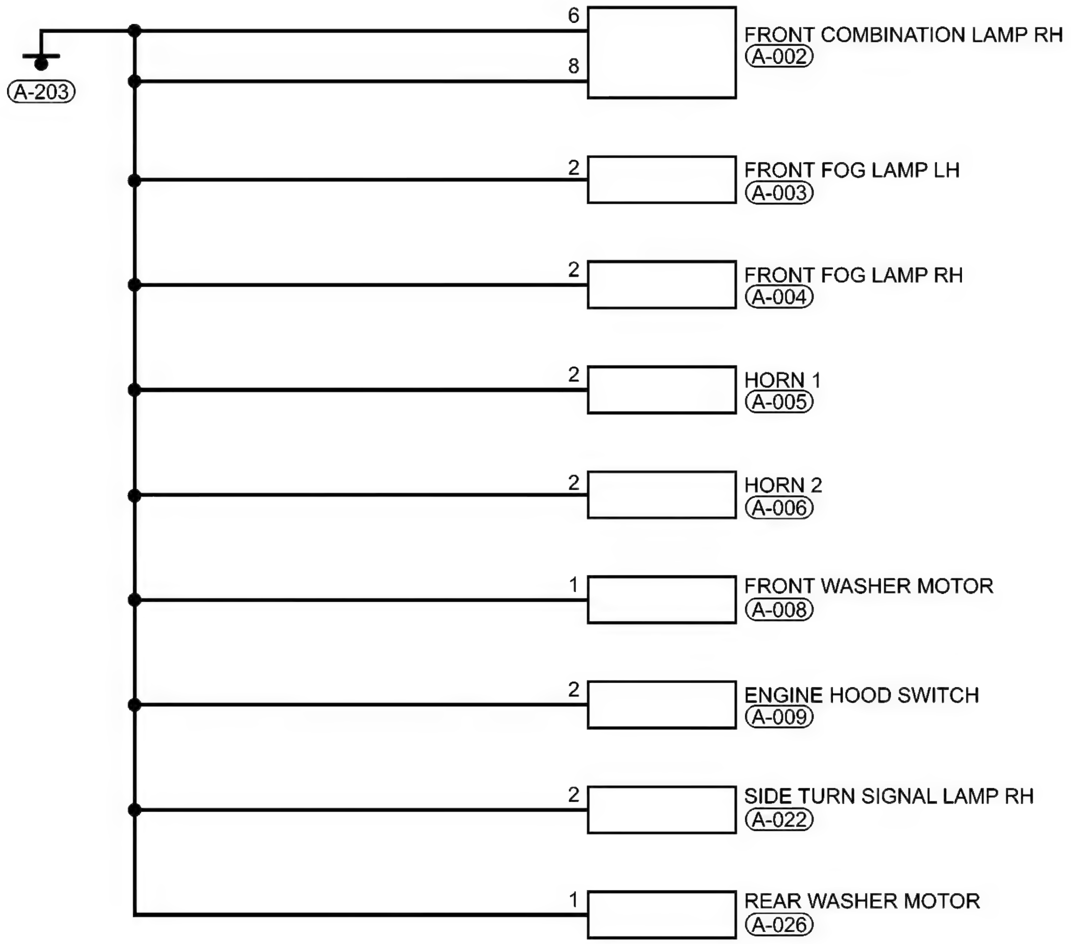
Electrical Schematics

The ground distribution electrical schematics include all wiring information detailed on the ground side of all vehicle circuits. This is helpful when attempting to troubleshoot a specific electrical failure, and shows connector pin-out information and splices.

Ground Distribution (Page 1 of 5)

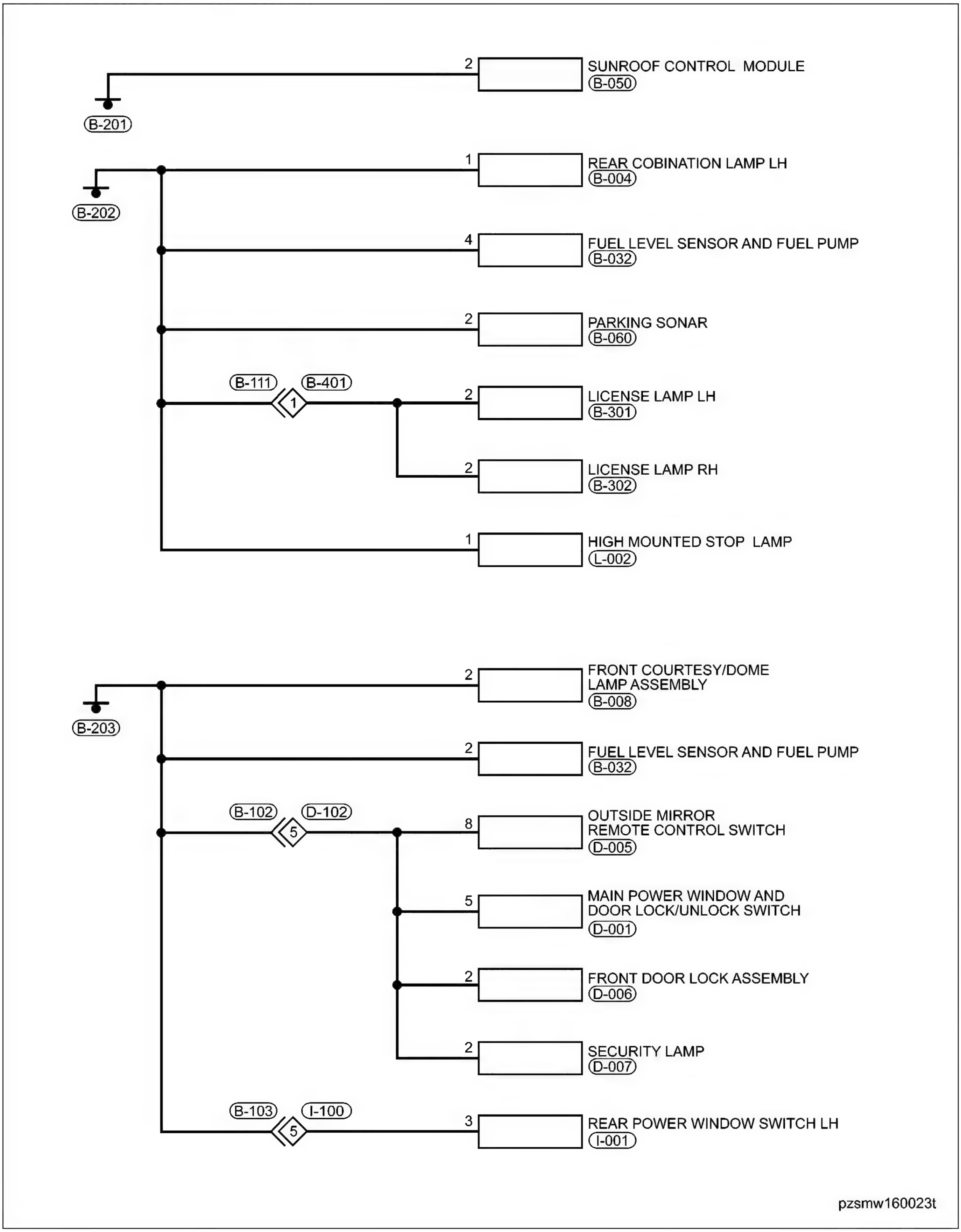

A-201
24
16
ABS HYDRAVLIC CONTROL MODULE
A-025
A-202
6
8
FRONT COMBINATION LAMP LH
A-001
3
COOLING FAN MOTOR RH
A-012
3
COOLING FAN MOTOR LH
A-013
2
SIDE TURN SIGNAL LAMP LH
A-021
1
BRAKE FLUID LEVEL SWITCH
A-030
2
SIREN
A-035
FRONT BODY FUSE BOX
A-040*
pzsmw160014t

Ground Distribution (Page 2 of 5)

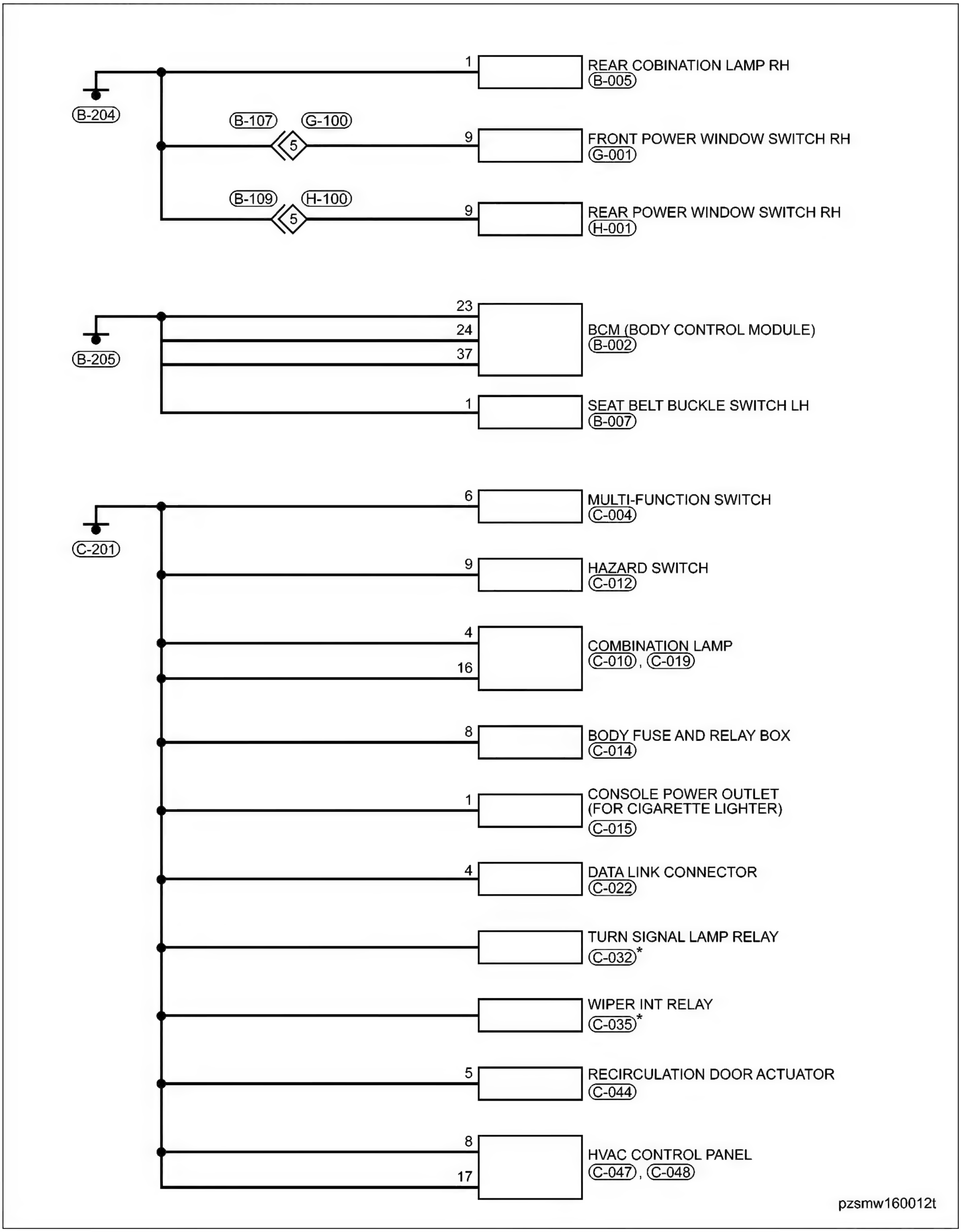

A-203
6
8
FRONT COMBINATION LAMP RH
A-002
2
FRONT FOG LAMP LH
A-003
2
FRONT FOG LAMP RH
A-004
2
HORN 1
A-005
2
HORN 2
A-006
1
FRONT WASHER MOTOR
A-008
2
ENGINE HOOD SWITCH
A-009
2
SIDE TURN SIGNAL LAMP RH
A-022
1
REAR WASHER MOTOR
A-026

pzsmw160015t

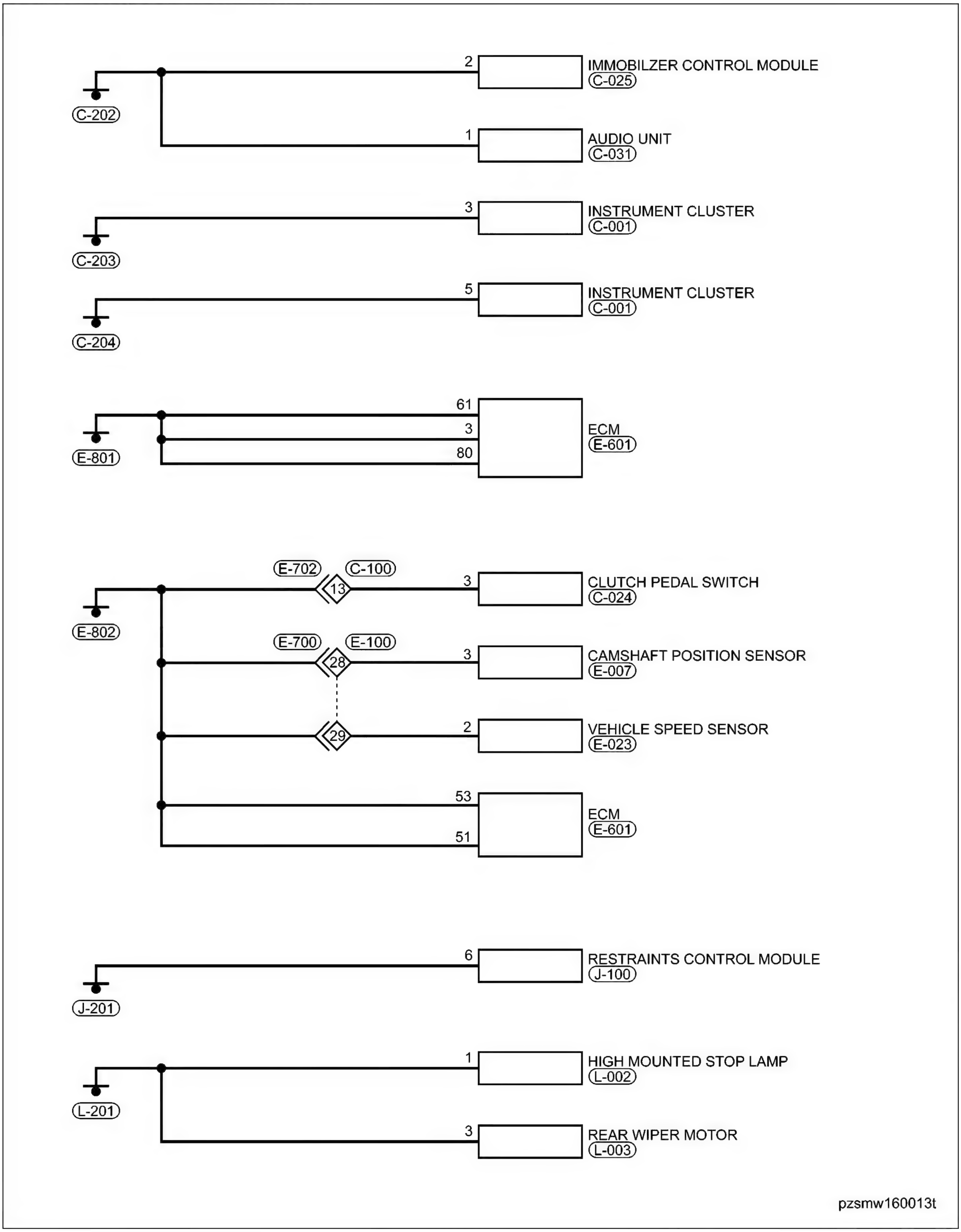
Ground Distribution (Page 3 of 5)


2
SUNROOF CONTROL MODULE
B-050
B-201
1
REAR COBINATION LAMP LH
B-004
B-202
4
FUEL LEVEL SENSOR AND FUEL PUMP
B-032
2
PARKING SONAR
B-060
B-111
B-401
1
2
LICENSE LAMP LH
B-301
2
LICENSE LAMP RH
B-302
1
HIGH MOUNTED STOP LAMP
L-002
2
FRONT COURTESY/DOME LAMP ASSEMBLY
B-008
B-203
2
FUEL LEVEL SENSOR AND FUEL PUMP
B-032
B-102
D-102
5
8
OUTSIDE MIRROR REMOTE CONTROL SWITCH
D-005
5
MAIN POWER WINDOW AND DOOR LOCK/UNLOCK SWITCH
D-001
2
FRONT DOOR LOCK ASSEMBLY
D-006
2
SECURITY LAMP
D-007
B-103
I-100
5
3
REAR POWER WINDOW SWITCH LH
I-001
pzsmw160023t

Ground Distribution (Page 4 of 5)


B-204
1
REAR COBINATION LAMP RH
B-005
B-107
G-100
5
9
FRONT POWER WINDOW SWITCH RH
G-001
B-109
H-100
5
9
REAR POWER WINDOW SWITCH RH
H-001
B-205
23
24
37
BCM (BODY CONTROL MODULE)
B-002
1
SEAT BELT BUCKLE SWITCH LH
B-007
C-201
6
MULTI-FUNCTION SWITCH
C-004
9
HAZARD SWITCH
C-012
4
16
COMBINATION LAMP
C-010, C-019
8
BODY FUSE AND RELAY BOX
C-014
1
CONSOLE POWER OUTLET (FOR CIGARETTE LIGHTER)
C-015
4
DATA LINK CONNECTOR
C-022
TURN SIGNAL LAMP RELAY
C-032*
WIPER INT RELAY
C-035*
5
RECIRCULATION DOOR ACTUATOR
C-044
8
17
HVAC CONTROL PANEL
C-047, C-048
pzsmw160012t

Ground Distribution (Page 5 of 5)


C-202
2
IMMOBILZER CONTROL MODULE
C-025
1
AUDIO UNIT
C-031
C-203
3
INSTRUMENT CLUSTER
C-001
C-204
5
INSTRUMENT CLUSTER
C-001
E-801
61
3
80
ECM
E-601
E-802
E-702
C-100
13
3
CLUTCH PEDAL SWITCH
C-024
E-700
E-100
28
3
CAMSHAFT POSITION SENSOR
E-007
29
2
VEHICLE SPEED SENSOR
E-023
53
51
ECM
E-601
J-201
6
RESTRAINTS CONTROL MODULE
J-100
L-201
1
HIGH MOUNTED STOP LAMP
L-002
3
REAR WIPER MOTOR
L-003
pzsmw160013t

VEHICLE FUSE BOX INFORMATION

GENERAL INFORMATION 16-29
Description 16-29
Operation 16-29

Front Fuse and Relay Box 16-29
Description 16-29
Operation 16-29
Overview 16-30

Body Fuse and Relay Box 16-31
Description 16-31
Operation 16-31
Overview 16-32

GENERAL INFORMATION

Description

In order to ensure the normal operation of the system, every electrical system is equipped with fuses and relays. The fuses and relays are stored in the fuse boxes.

The vehicle fuses and relays are located in the following locations:
- Front Fuse and Relay Box
- Body Fuse and Relay Box

Operation

When replacing a open fuse, it is important to use only a fuse having the correct amperage rating. The use of a fuse with a rating other than indicated may result in a dangerous electrical system overload. If a properly rated fuse continues to open, it indicates a problem in the circuit that must be corrected.

Front Fuse and Relay Box

Description

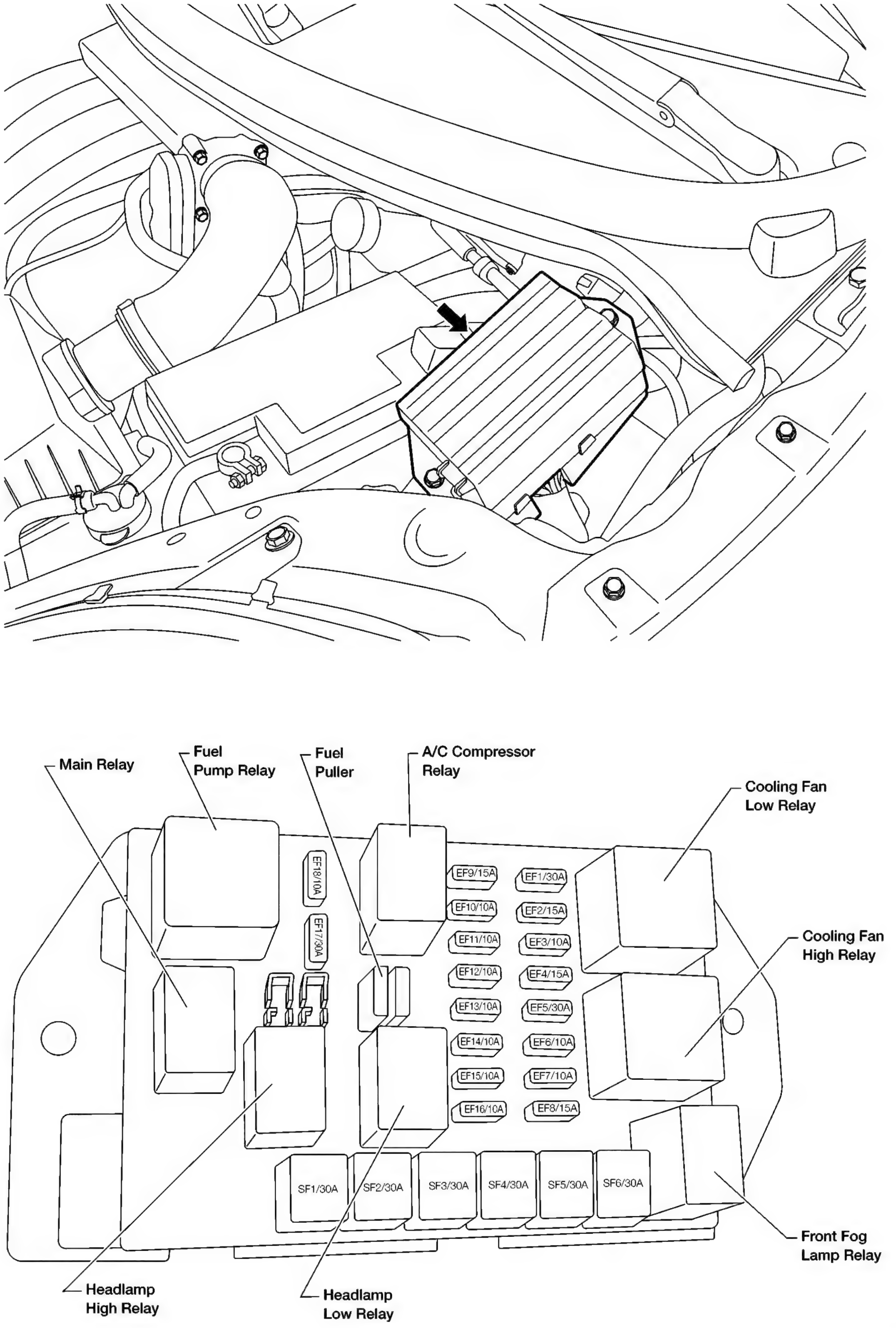
The front fuse and relay box houses many of the fuses and relays for the vehicles electrical system. The front fuse and relay box is located on the right side of the engine compartment and under the cowl top of windshield. All the fuses and relays cannot be serviced, if the fuse or relay cannot be replaced, the fuse and relay box must be replaced as a unit.

Operation

When a circuit fails, the fuse will blow and remove current from the circuit. The front fuse and relay box is equipped with a label that identifies each component. The label is printed on the inside of the cover. The power fuse box identifies the rating of each fuse individually. Turn off the ignition switch, and then replace the fuse.

Overview

Front Fuse and Relay Box


Main Relay
Fuel Pump Relay
Fuel Puller
A/C Compressor Relay
Cooling Fan Low Relay
Cooling Fan High Relay
Front Fog Lamp Relay
Headlamp High Relay
Headlamp Low Relay
EF18/10A
EF17/30A
EF9/15A
EF10/10A
EF11/10A
EF12/10A
EF13/10A
EF14/10A
EF15/10A
EF16/10A
EF1/30A
EF2/15A
EF3/10A
EF4/15A
EF5/30A
EF6/10A
EF7/10A
EF8/15A
SF1/30A
SF2/30A
SF3/30A
SF4/30A
SF5/30A
SF6/30A

pzsmw160004t

Body Fuse and Relay Box

Description

The body fuse and relay box houses many of the fuses and relays for the vehicle's electrical system. The body fuse and relay box is situated on the left front side of the interior of the cabin and under the instrument panel, which is mounted on the cross beam of the instrument panel. All the fuses and relays cannot be serviced it must be replaced as a unit.

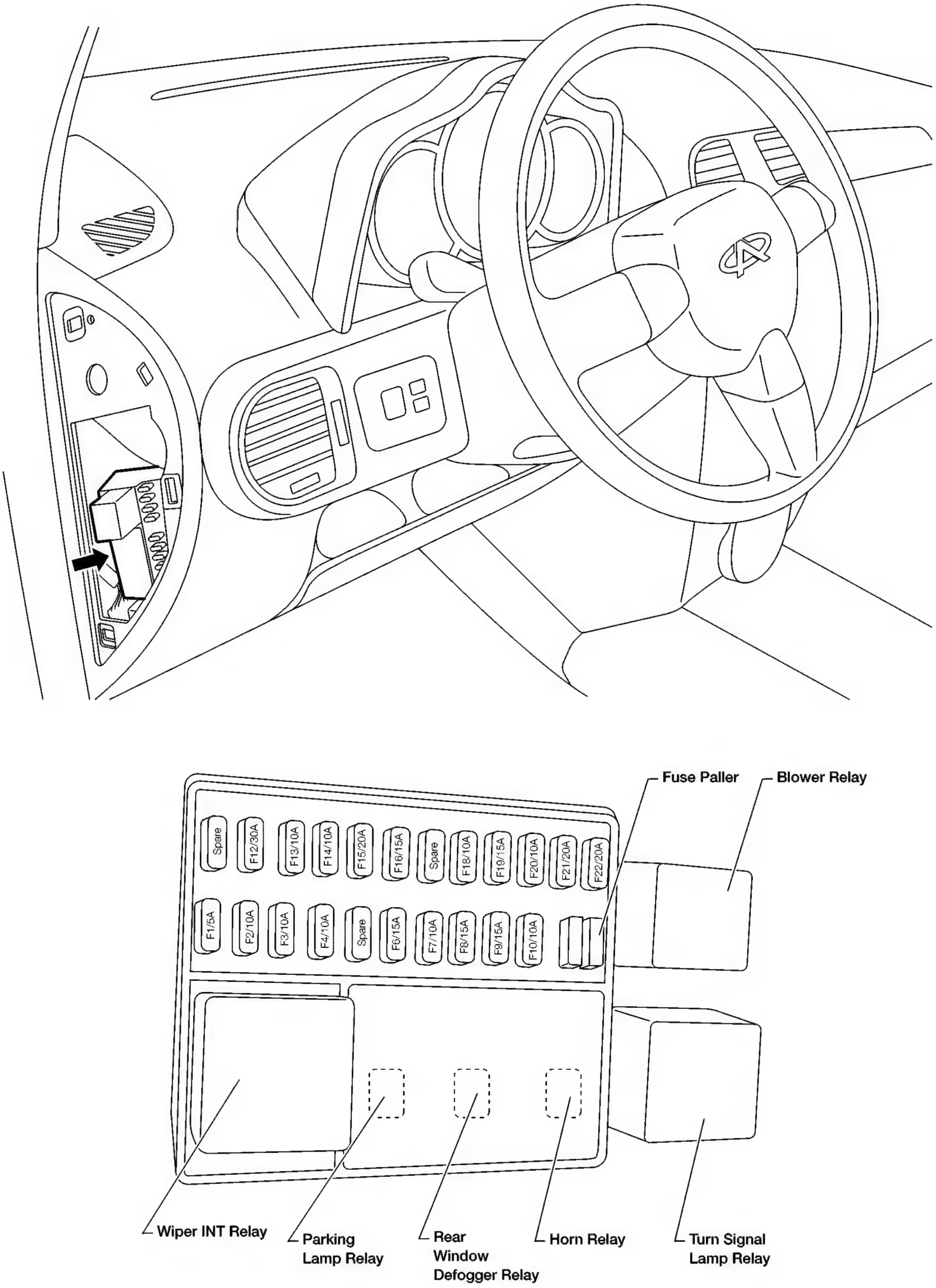
Operation

When a circuit fails, the fuse will blow and remove current from the circuit.

Turn off the ignition switch, and then replace the fuse.

Overview

Body Fuse and Relay Box


Spare
F12/30A
F13/10A
F14/10A
F15/20A
F16/15A
Spare
F18/10A
F19/15A
F20/10A
F21/20A
F22/20A
F1/5A
F2/10A
F3/10A
F4/10A
Spare
F6/15A
F7/10A
F8/15A
F9/15A
F10/10A
Fuse Paller
Blower Relay
Wiper INT Relay
Parking Lamp Relay
Rear Window Defogger Relay
Horn Relay
Turn Signal Lamp Relay

pzsmw160009t

VEHICLE WIRING HARNESS LAYOUT

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GENERAL INFORMATION

Description

This section provides illustrations identifying component, ground and splice locations in the vehicle.

To help locate all electrical components on the drawings, the following harness layouts use a map style grid:

- Engine Control Harness
- Engine Room Harness
- Main Harness
- Body Harness
- Front Door LH Harness
- Front Door RH Harness
- Rear Door LH Harness
- Rear Door RH Harness
- Back Door Harness
- Restraints Harness
- Body SUB Harness and Parking Sonar Harness

Operation

Use the wiring harness diagrams in each harness section for component, ground and splice identification. Refer to the appropriate index for the specific vehicle harness.

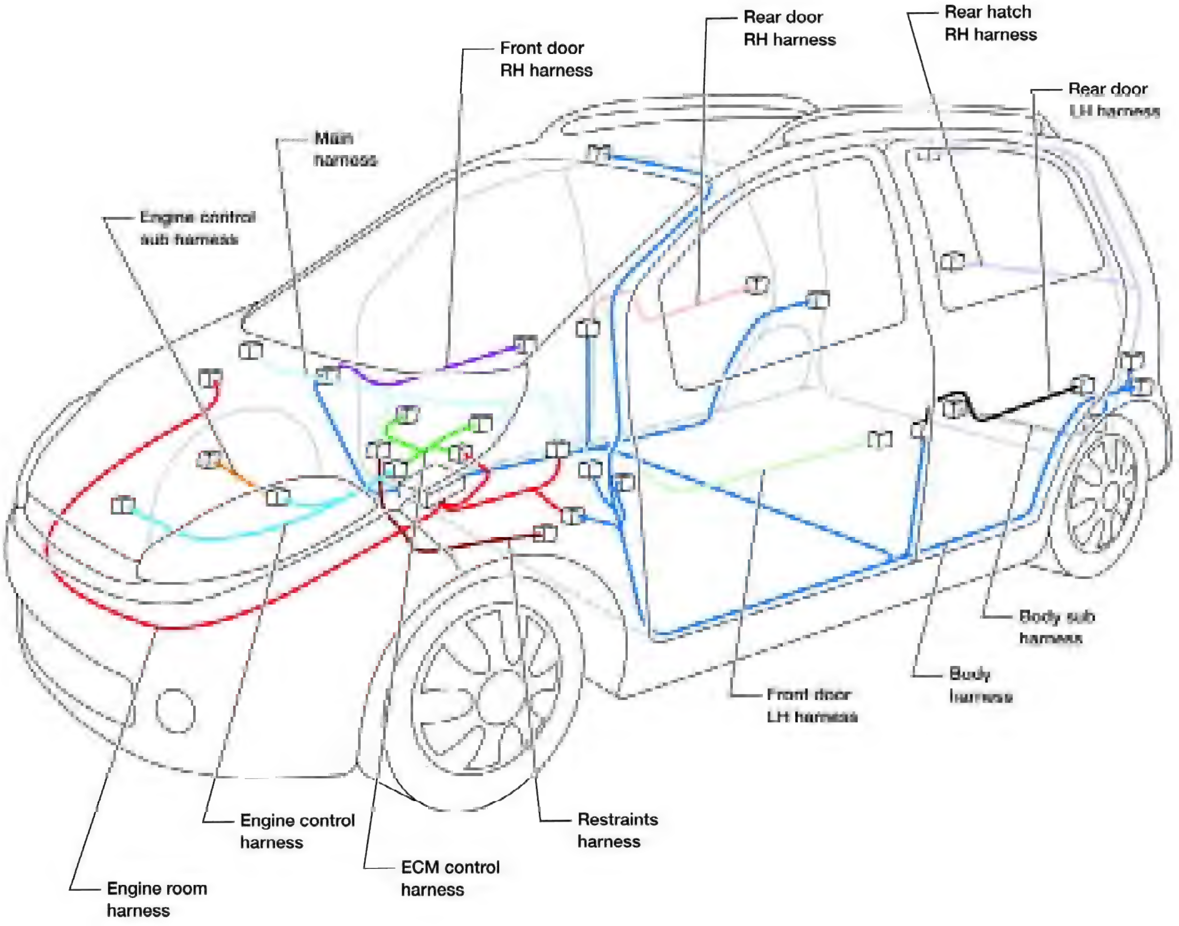
How To Read Harness Layout Diagrams

1. Find the desired connector number on the connector list.
2. Find the grid reference.
3. On the drawing, find the crossing of the grid reference column letter and row number.
4. Find the connector number in the crossing zone.
5. Follow the line (if used) to the connector.

VEHICLE HARNESS ROUTING MAPS

Vehicle Harness Layout

Vehicle Harness Layout (Page 1 of 1)


Rear door
RH harness
Rear hatch
RH harness
Front door
RH harness
Rear door
LH harness
Main
harness
Engine control
sub harness
Body sub
harness
Body
harness
Front door
LH harness
Engine control
harness
Restraints
harness
ECM control
harness
Engine room
harness

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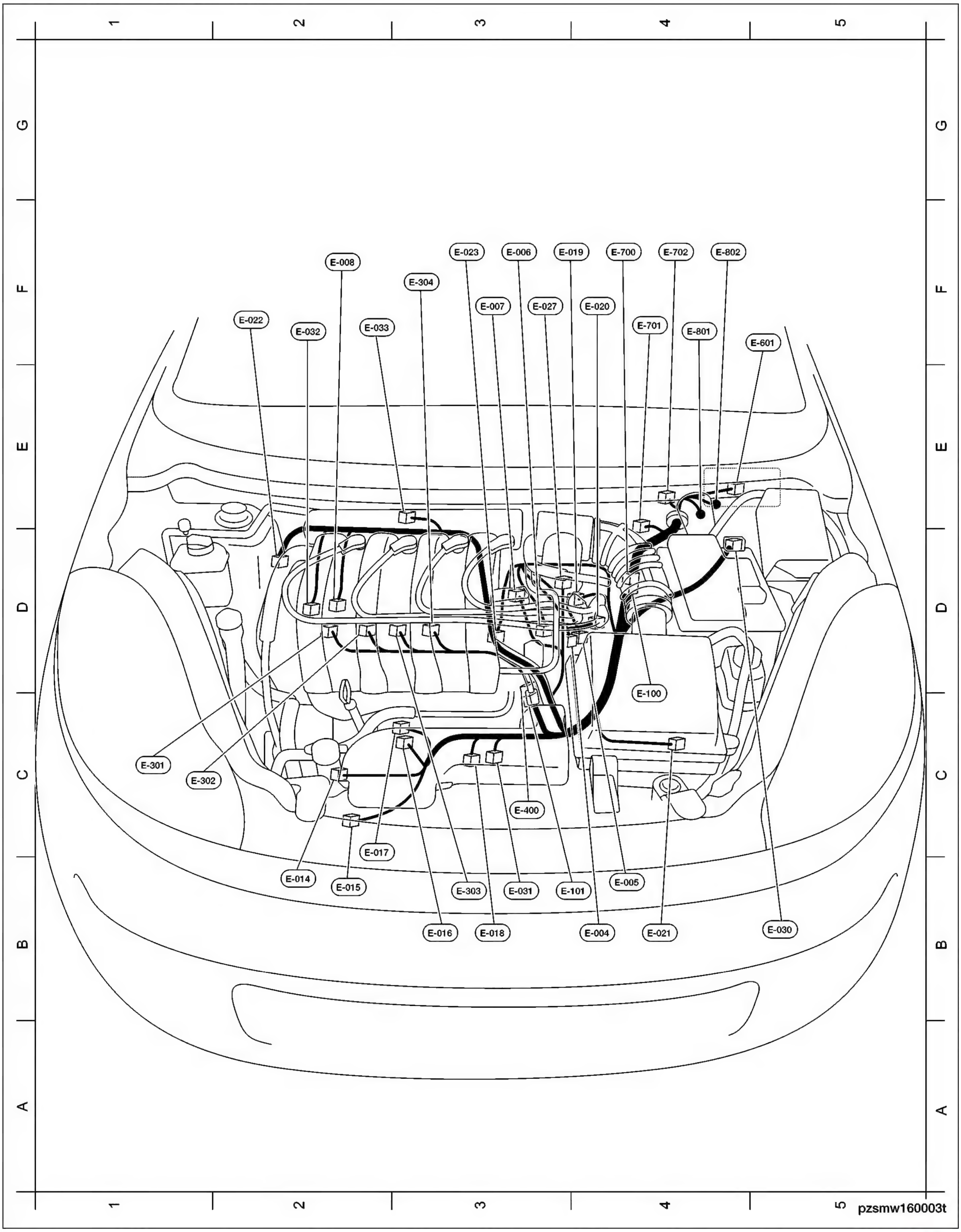
Engine Control Harness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E-303
E-031
E-101
E-005
E-016
E-018
E-004
E-021
E-030
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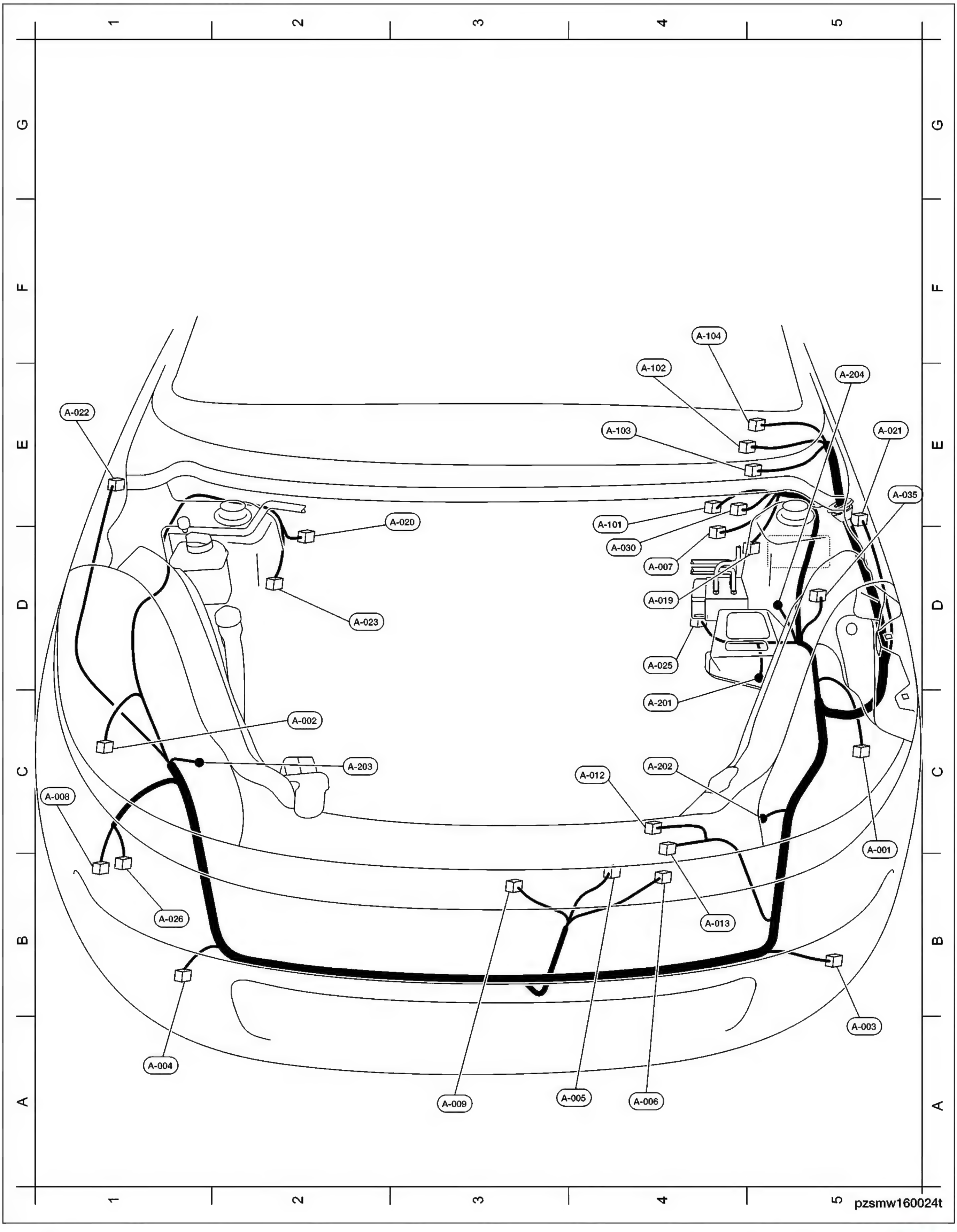
E-004	W-O/4	Upstream Oxygen Sensor	D3
E-005	W-O/4	Downstream Oxygen Sensor	D4
E-006	B/3	Crankshaft Position Sensor	D3
E-007	W/2	Camshaft Position Sensor	D3
E-008	W/2	Generator	D2
E-014	B/1	Power Steering Switch	C2
E-015	B/1	A/C Compressor	C2
E-016	W/1	Oil Pressure Switch	C2
E-017	B/3	Knock Sensor	C3
E-018	B/1	Starter Motor	C3
E-019	B/2	Engine Coolant Temperature Sensor	D4
E-020	B/4	Ignition Coil	D4
E-021	B/2	Backup Lamp Switch	C4
E-022	B/2	Canister Control Valve	D4
E-027	B/6	Electronic Throttle Control Actuator	D3
E-030	B/1	Battery	D5
E-031	B/1	Starter Motor	C3
E-032	B/1	Generator	D2
E-033	B/4	Manifold Absolute Pressure Sensor	E3
E-100	B/42	To E-700	D4
E-101	B/6	To E-400	C3
E-301	B/2	Fuel Injector No.1	D2
E-302	B/2	Fuel Injector No.2	D2
E-303	B/2	Fuel Injector No.3	D3
E-304	B/2	Fuel Injector No.4	D3
E-400	B/2	To E-101	C3
E-601	B/81	ECM (Engine Control Module)	E4
E-700	B/42	To E-100	D4
E-701	B/16	A-101	D4
E-702	B/22	To C-100	E4
E-801	-	Ground	E4
E-802	-	Ground	E4

Engine Room Harness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A-008
A-001
A-026
A-013
A-003
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A-006
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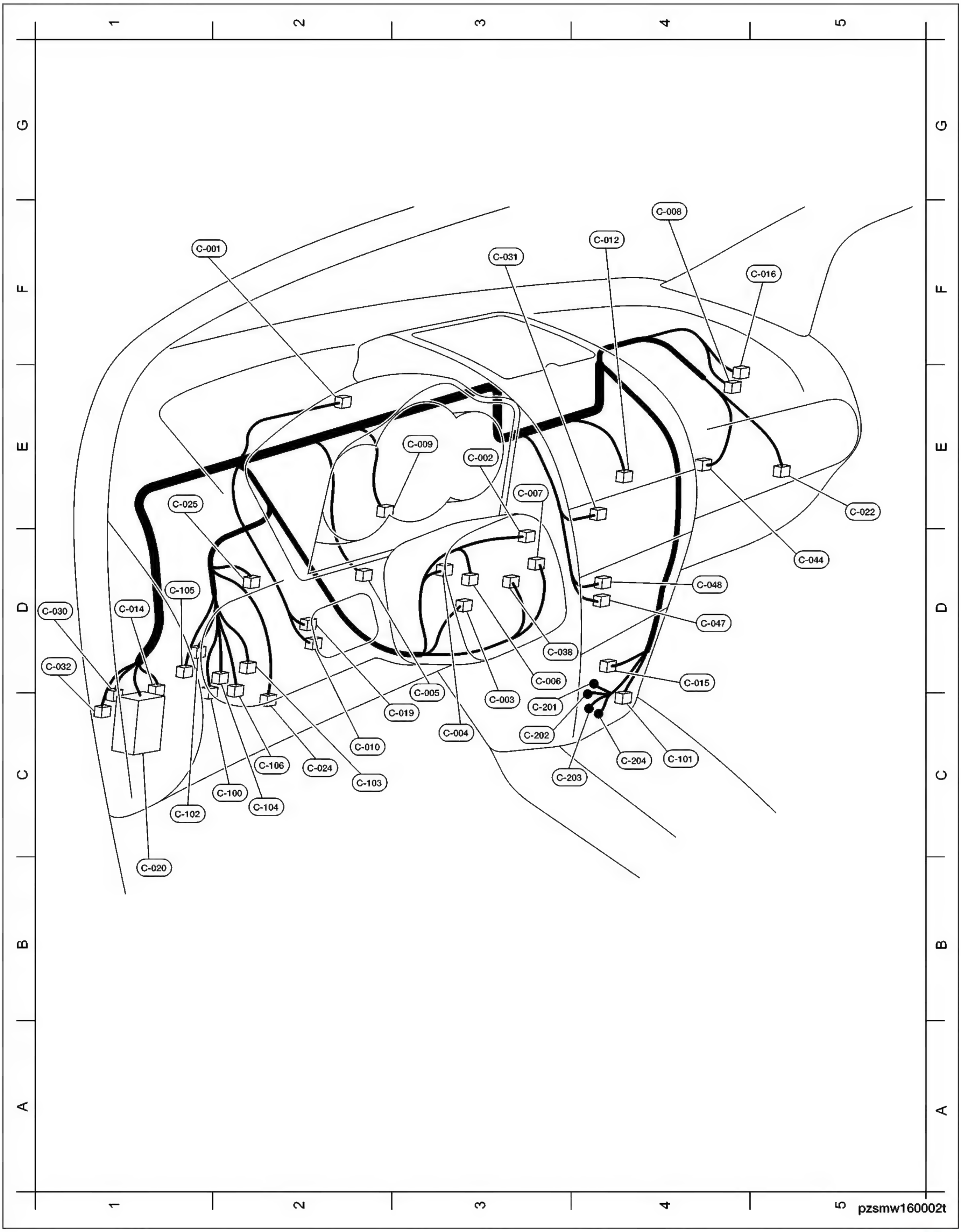
A-001	B/10	Front Combination Lamp LH	C5
A-002	B/10	Front Combination Lamp RH	C1
A-003	B/2	Front Fog Lamp LH	B5
A-004	B/2	Front Fog Lamp RH	B1
A-005	GR/1	Horn 1	B4
A-006	GR/2	Horn 2	B4
A-007	B/4	Front Wiper Motor	D4
A-008	B/2	Front Washer Motor	C1
A-009	B/3	Hood Switch	B3
A-012	B/3	Cooling Fan Assembly LH	C4
A-013	B/3	Cooling Fan Assembly RH	B4
A-019	B/2	Wheel Speed Sensor LH Front	D4
A-020	B/2	Wheel Speed Sensor RH Front	D5
A-021	B/2	Side Turn Signal Lamp LH	E5
A-022	B/2	Side Turn Signal Lamp RH	E1
A-023	B/2	A/C Pressure Switch	D2
A-025	B/25	ABS Hydraulic Control Module	D4
A-026	B/2	Front Washer Motor	B1
A-030	B/2	Brake Fluid Level Switch	E4
A-035	B/2	Siren	D5
A-040	B/2	Front Body and Relay Box	D4
A-101	B/16	To E-701	E4
A-102	B/26	To C-102	E4
A-103	B/4	To C-103	E4
A-104	W/15	To B-104	E4
A-201	-	Ground	D4
A-202	-	Ground	C4
A-203	-	Ground	C1
A-204	-	Ground	D4

Main Harness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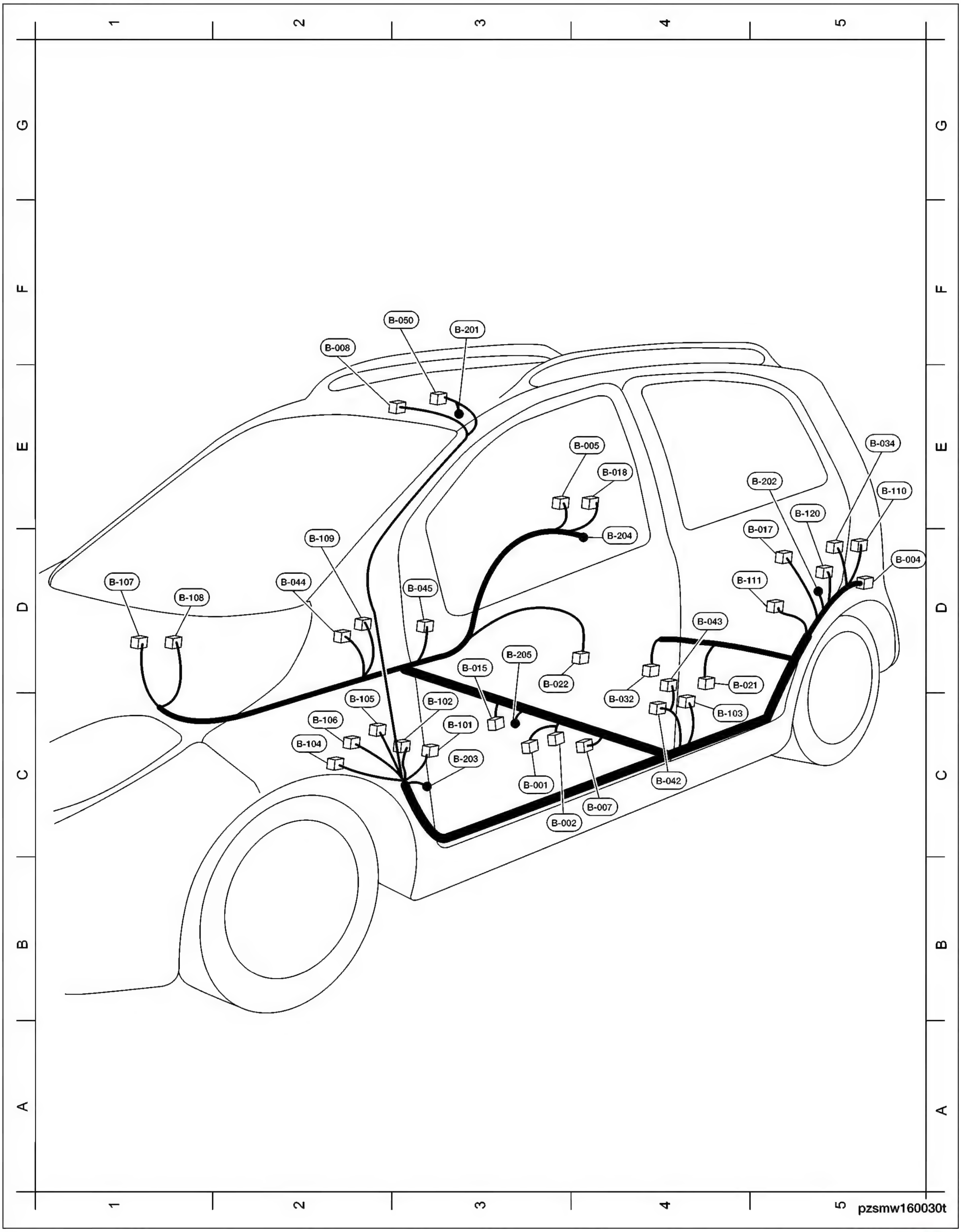
C-001	L/32	Instrument Cluster	E2
C-002	W/2	Wiper and Washer Switch	D3
C-004	W/6	Multi-Function Switch	D3
C-005	Y/4	Brake Switch	D2
C-006	W/7	Multi-Function Switch	D3
C-007	W/9	Wiper and Washer Switch	D3
C-008	W/2	Blower Motor	F4
C-009	B/6	Accelerator Pedal Position Sensor	C3
C-010	W/10	Front Fog Lamp Switch	D2
C-012	W/10	Hazard Switch	F4
C-014	W/20	Body Fuse and Relay Box	D1
C-015	W/2	Console Power Outlet (For Cigarette Lighter)	D1
C-016	W/4	Speed Resistor	F4
C-019	B/6	Dimmer Control Switch	D2
C-020	-	Body Fuse and Relay Box	C1
C-022	G/16	Data Link Connector	E5
C-024	B/2	Clutch Pedal Switch	C2
C-025	B/8	Immobilizer Control Module	E1
C-030	-	Blower Relay	D1
C-031	W/16	Audio	E4
C-032	-	Turn Signal Lamp Switch	D1
C-038	W/1	Horn Switch	D3
C-044	B/5	Recirculation Door Actuator	E4
C-047	B/16	HVAC Control Panel	D4
C-048	C/8	HVAC Control Panel	D4
C-100	B/22	To E-702	C2
C-101	Y/6	To J-101	C4
C-102	B/26	To A-102	D2
C-103	B/4	To A-103	D3
C-104	W/1	To E-703	D2
C-105	W/26	To B-105	D1
C-106	W/4	To B-106	C2
C-201	-	Ground	C3
C-202	-	Ground	C3
C-203	-	Ground	C4
C-204	-	Ground	C4

Body Harness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B-102
B-103
B-106
B-101
B-104
B-203
B-042
B-001
B-007
B-002
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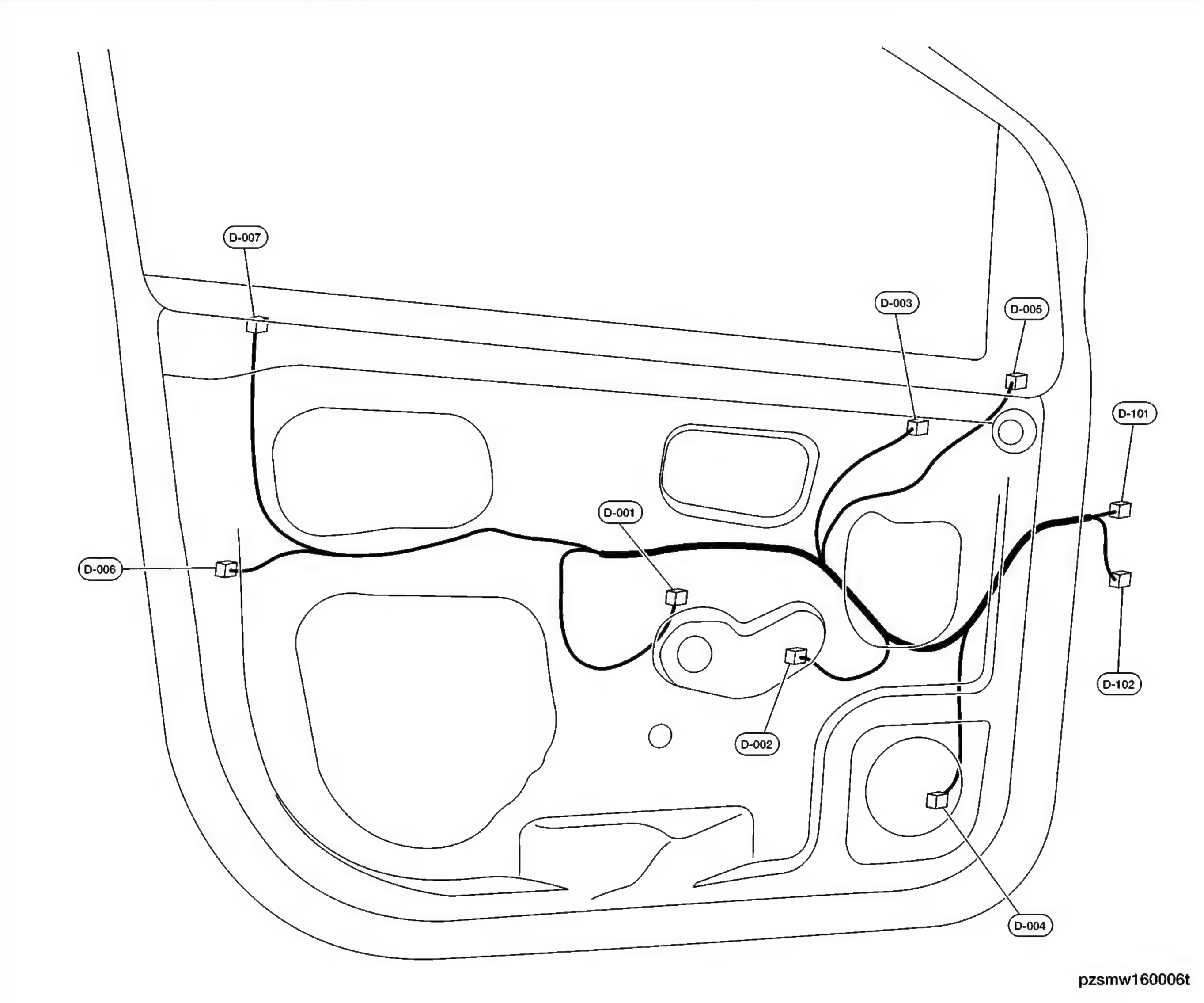
B-001	W/16	BCM (Body Control Module)	C3
B-002	B/25	BCM (Body Control Module)	C3
B-004	W/6	Rear Combination Lamp LH	D5
B-005	W/6	Rear Combination Lamp RH	E3
B-007	W/2	Seat Belt Buckle Switch	C4
B-008	B/2	Front Dome Lamp Assembly	E2
B-015	B/1	Parking Brake Switch	C3
B-017	B/2	Rear Speaker LH	D4
B-018	B/2	Rear Speaker RH	E3
B-021	B/2	Rear Wheel Speed Sensor LH	C4
B-022	B/2	Wheel Speed Sensor RH	D4
B-032	B/4	Fuel Lever Sensor and Fuel Pump	D4
B-034	W/2	Trunk Lamp	D5
B-042	w/1	Front Door Unlock Switch LH	C4
B-043	w/1	Rear Door Unlock Switch LH	C4
B-044	B/4	Front Door Unlock Switch RH	D2
B-045	W/18	Rear Door Unlock Switch RH	D3
B-050	W/14	Sunroof Control Module	E3
B-101	W/14	To D-101	C1
B-102	W/10	To D-102	C1
B-103	B/10	To I-100	C4
B-104	W/15	To A-104	C2
B-105	W/26	To C-105	C3
B-106	W/4	To C-106	C2
B-107	W/10	To G-100	D1
B-108	W/6	To G-101	D1
B-109	W/10	To H-104	D2
B-110	W/6	To L-100	E5
B-111	W/2	To B-401	D4
B-120	W/2	Sonar Module	D5
B-201	-	Ground	E3
B-202	-	Ground	D5
B-203	-	Ground	C3
B-204	-	Ground	D3
B-205	-	Ground	C3

Front Door LH Harness


D-007
D-003
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D-001
D-006
D-102
D-002
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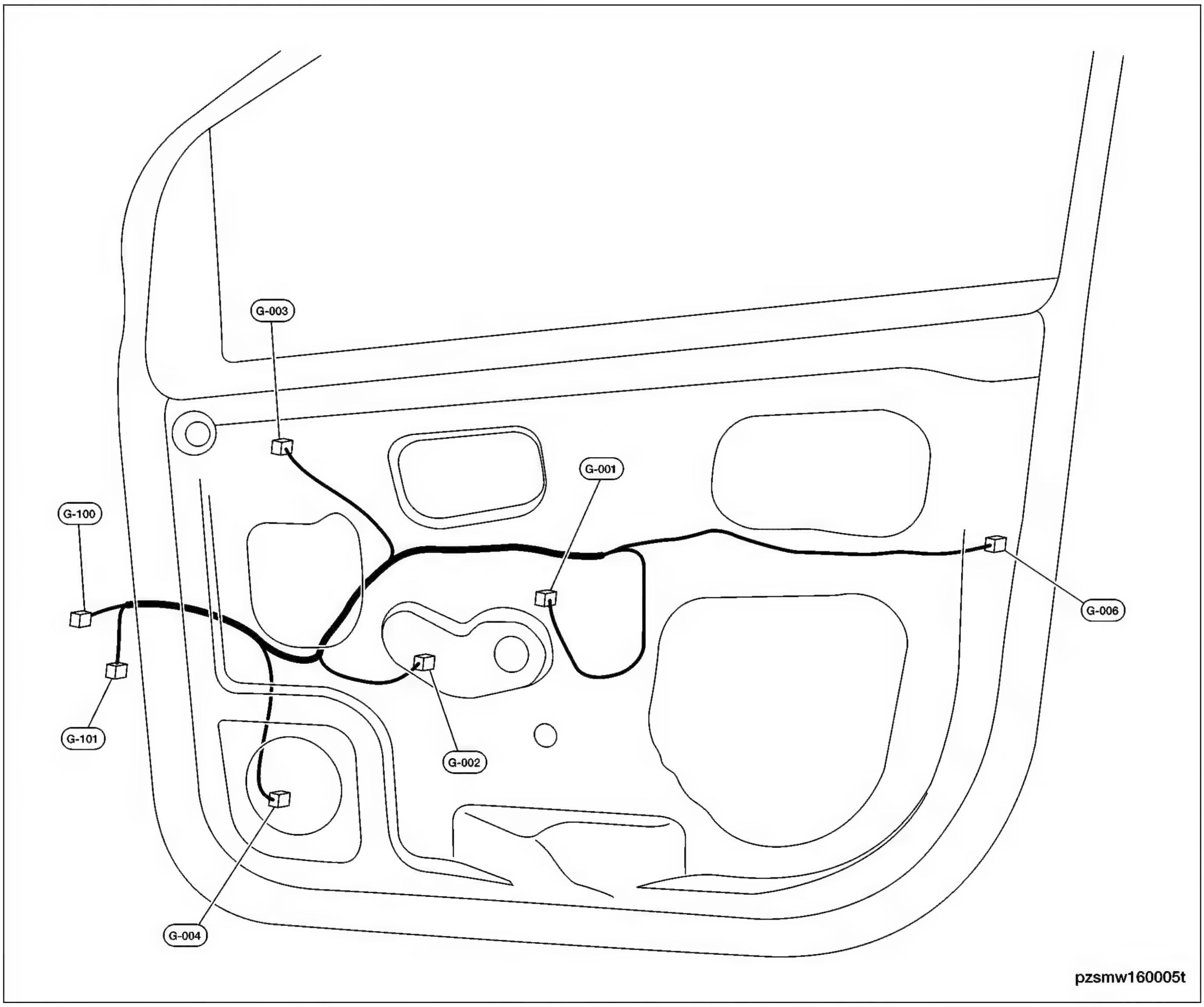
D-001	Y/16	Main Power Window and Door Lock/Unlock Switch
D-002	W/2	Front Power Window Motor LH
D-003	B/3	Outside Mirror LH
D-004	B/2	Front Speaker LH
D-005	B/10	Outside Mirror Remote Control Switch
D-006	B/4	Front Door Lock Assembly LH
D-007	W/2	Security Lamp
D-101	W/14	To B-101
D-102	W/10	To B-102

Front Door RH Harness


G-003
G-001
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G-006
G-101
G-002
G-004
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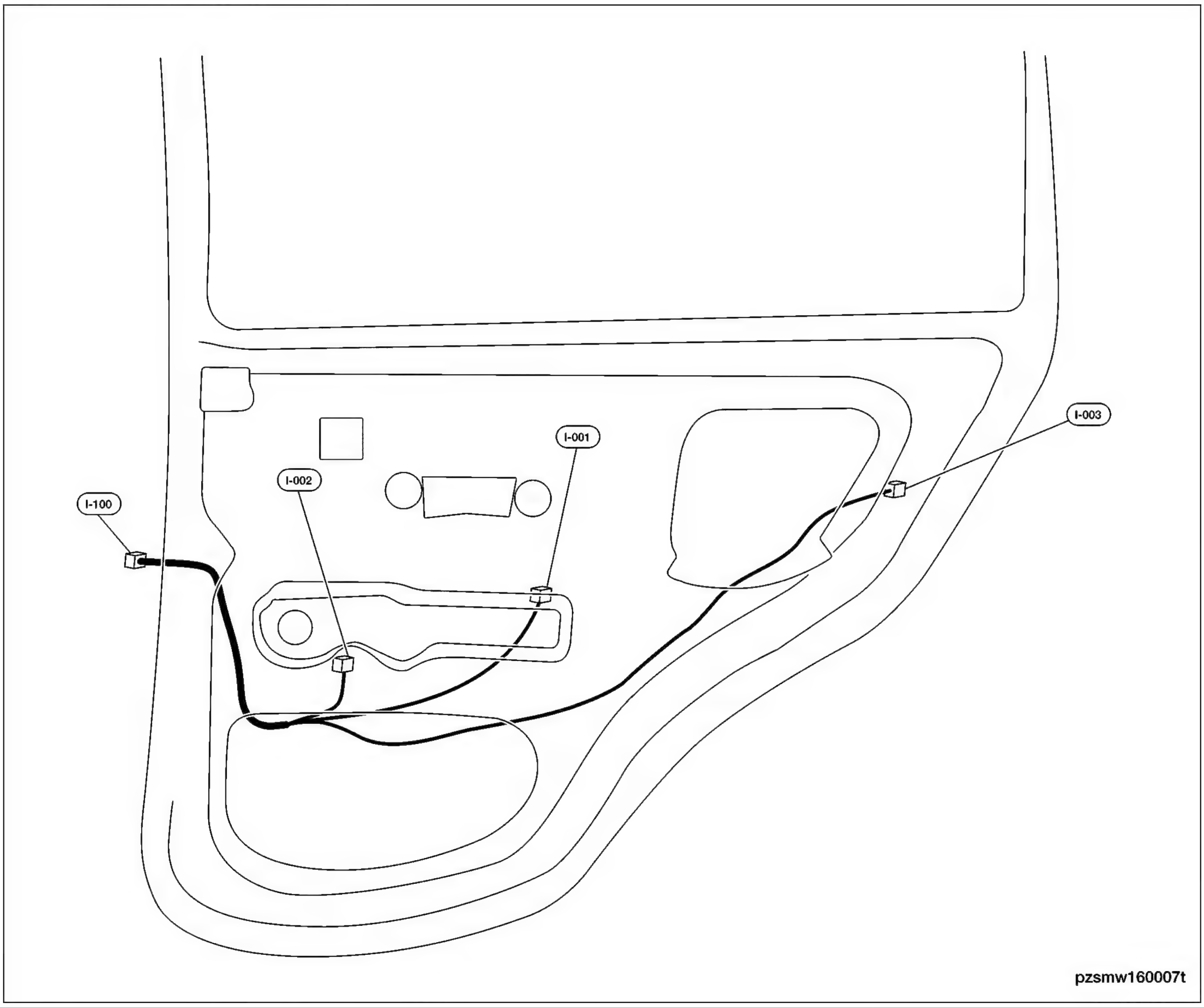
G-001	B/10	Front Power Window Switch RH
G-002	W/2	Front Power Window Motor RH
G-003	B/3	Outside Mirror RH
G-004	B/2	Front Speaker RH
G-006	W/4	Front Door Lock Assembly RH
G-100	W/10	To B-108
G-101	W/6	To B-107

Rear Door RH Harness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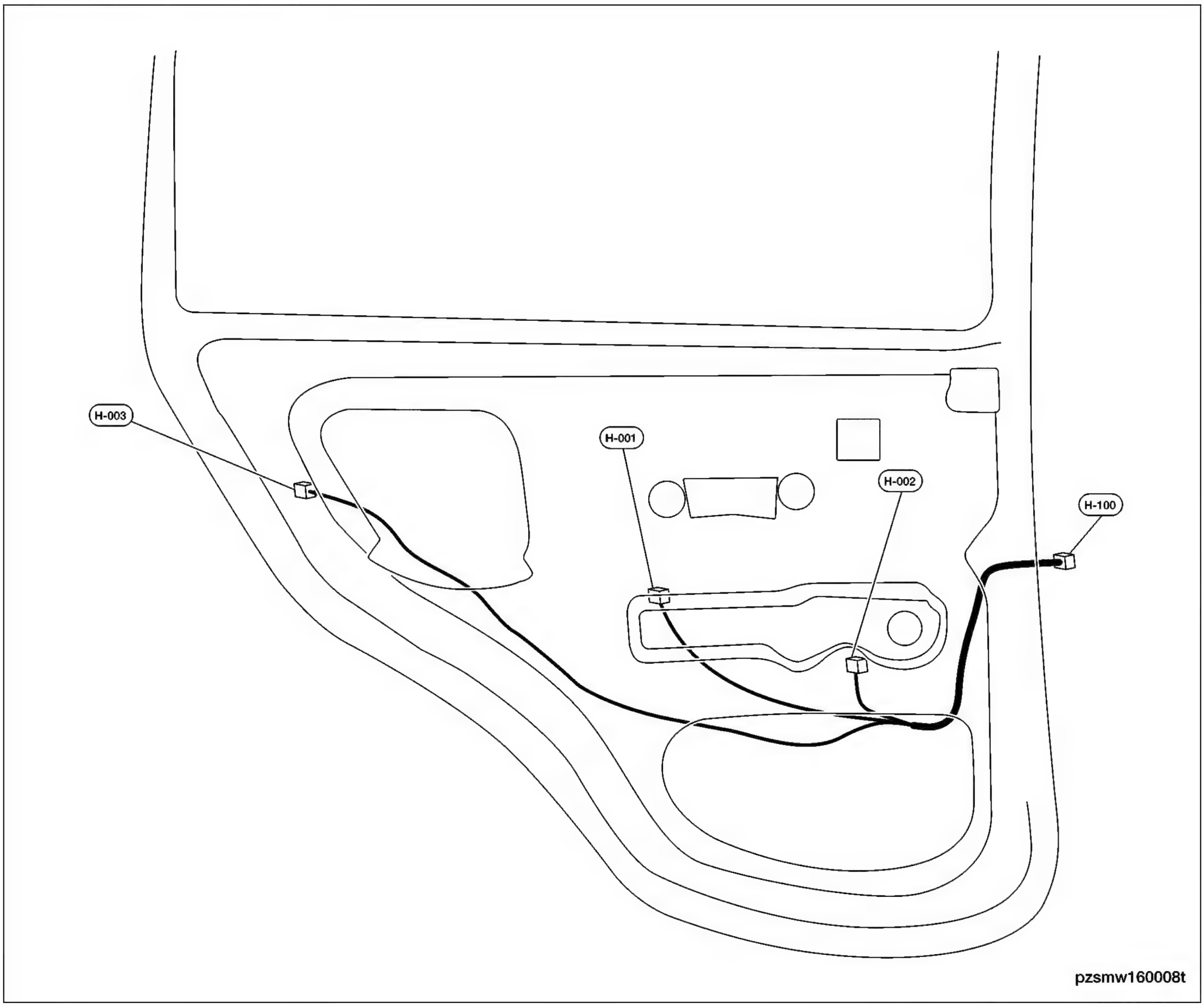
I-001	W/10	Rear Power Window Switch LH
I-002	B/2	Rear Power Window Motor LH
I-003	B/4	Rear Door Lock Assembly LH
I-100	B/10	To B-103

Rear Door LH Harness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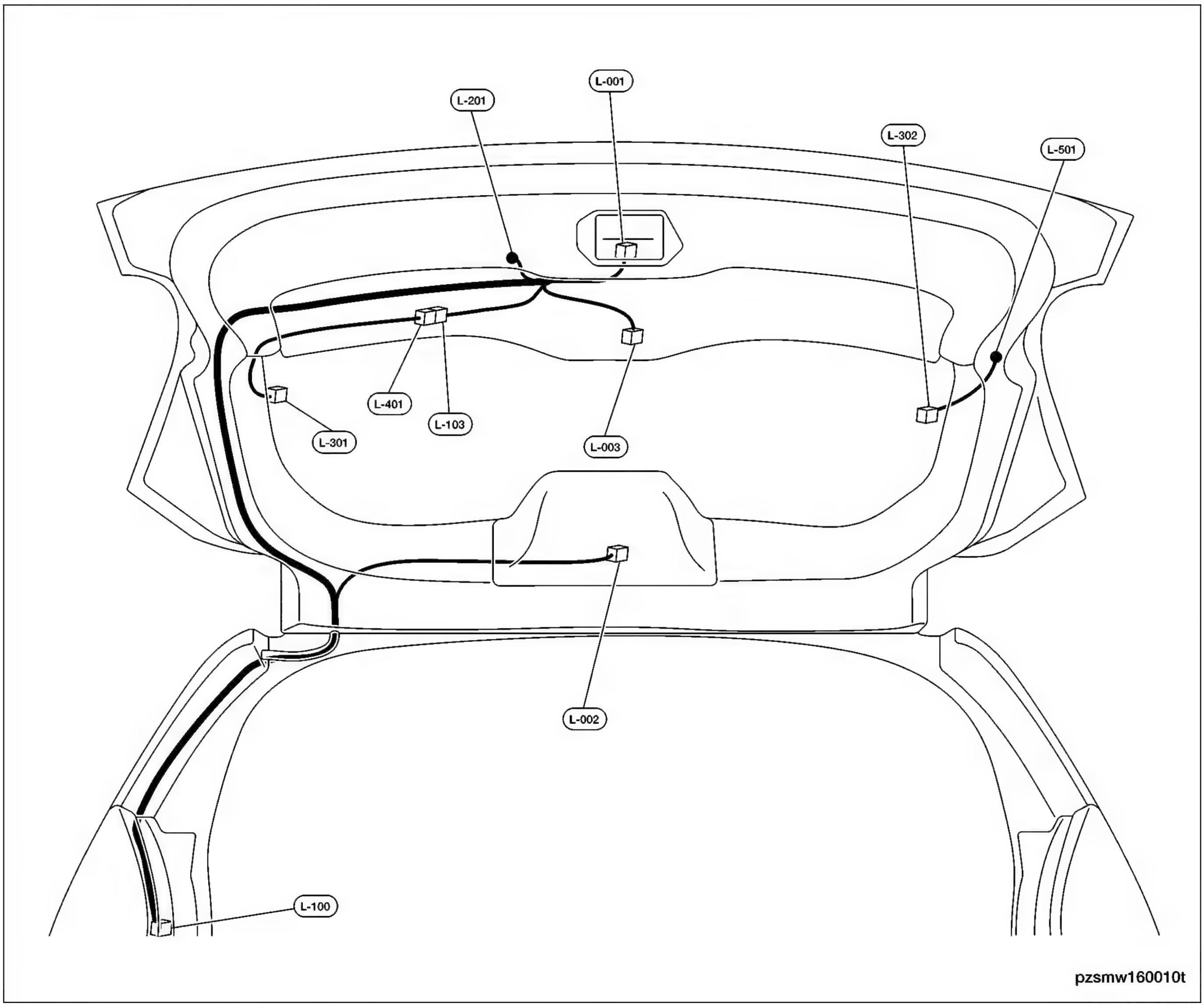
H-001	W/10	Rear Power Window Switch RH
H-002	B/2	Rear Power Window Motor RH
H-003	B/4	Rear Door Lock Assembly RH
H-100	B/10	To B-109

Back Door Harness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L-003
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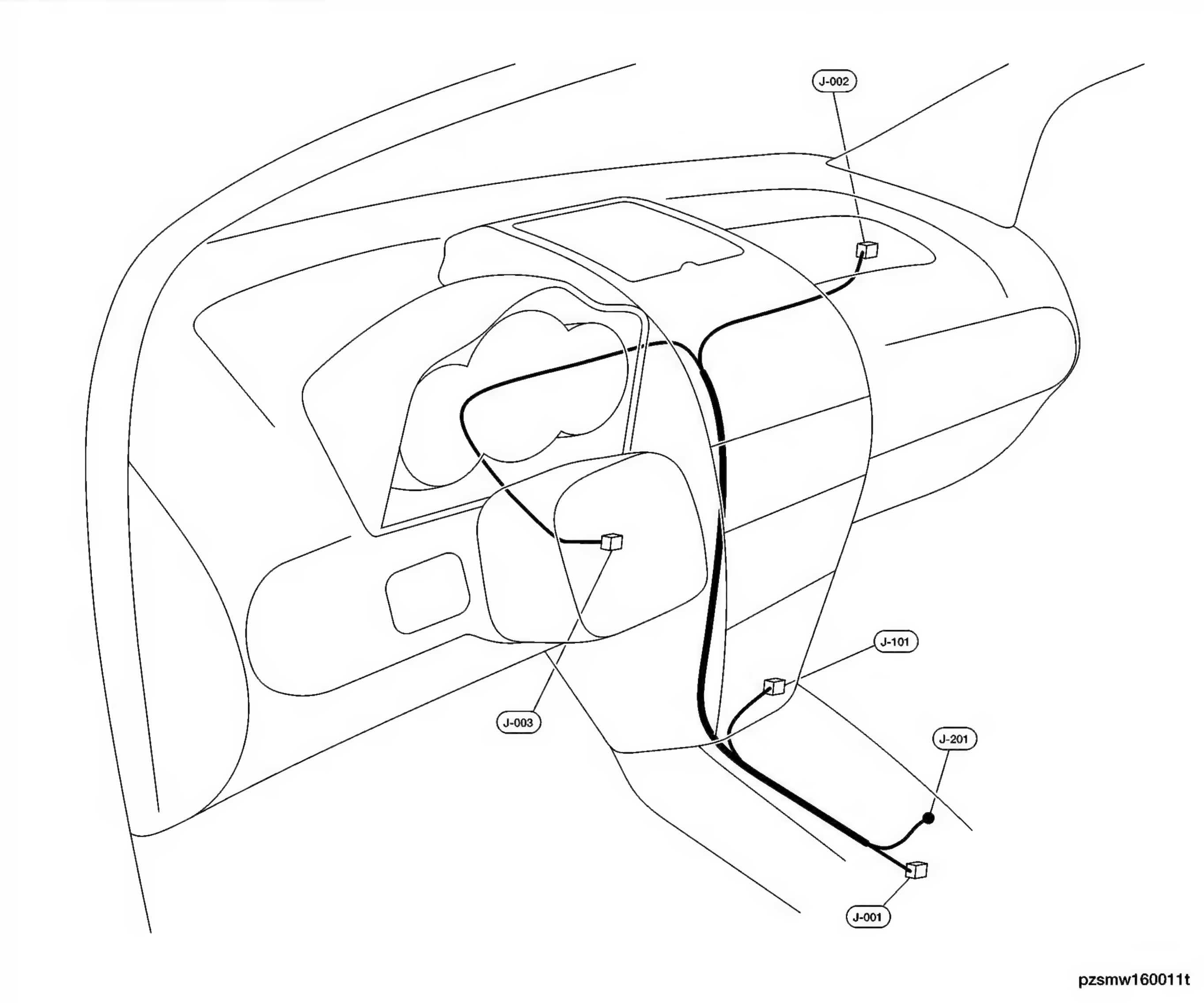
L-001	W/2	Trunk Room Switch
L-002	B/2	High Mounted Stop Lamp
L-003	GR/4	Back Door Lock Assembly Rear Wiper Motor
L-100	GR/4	Back Door Lock Assembly To B-110
L-103	B1	To L-401
L-201	W/2	Ground
L-301	B/2	Rear Window Defogger
L-302	W/2	Rear Window Defogger
L-401	W/14	To B-110
L-501	-	Ground

Restraints Harness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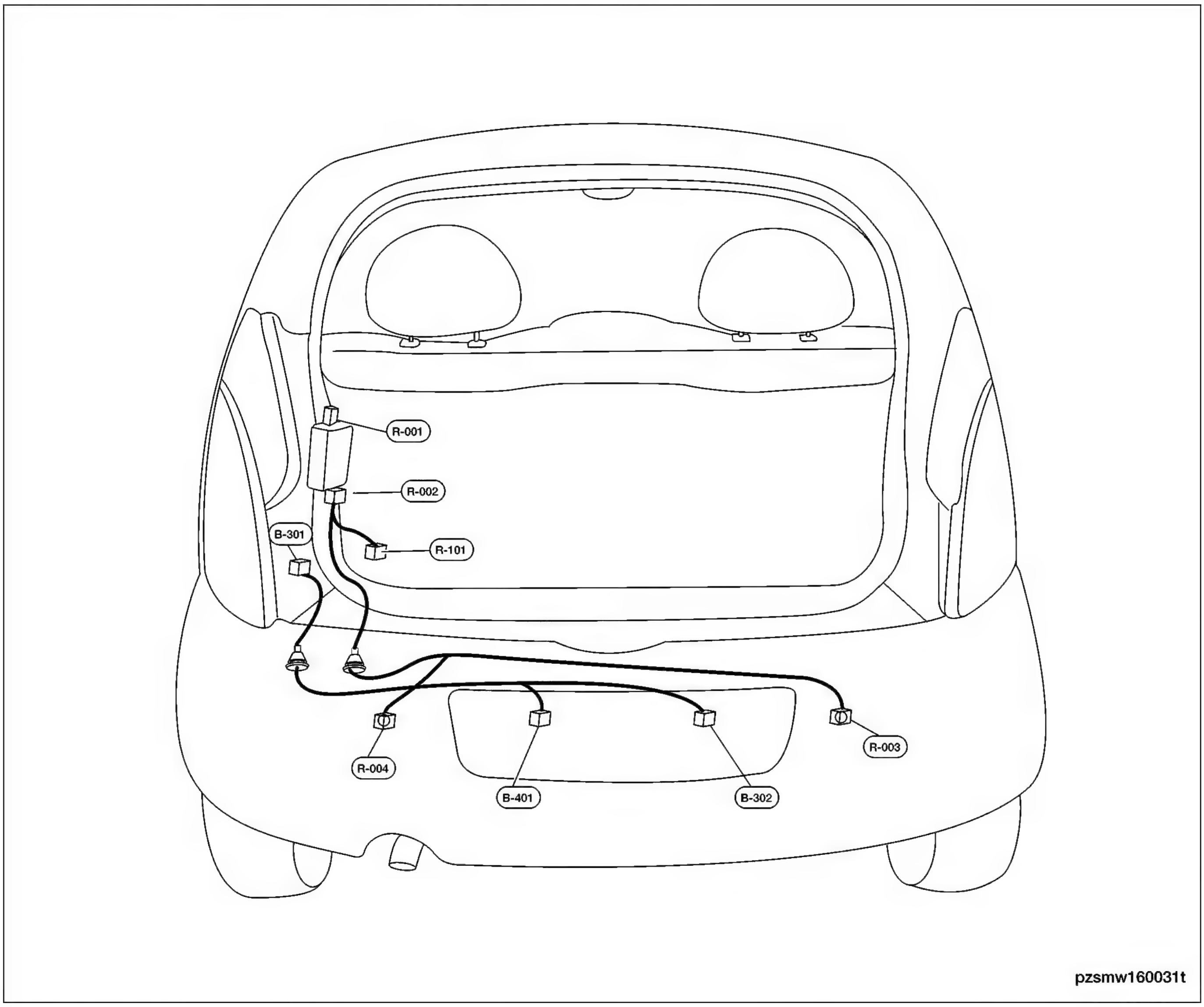
J-001	W/25	Restraints Control Module
J-002	G/2	Front Passenger Airbag
J-003	G/2	Driver Airbag
J-005	B/2	Spiral Cable
J-100	W/6	To C-101
J-201	-	Ground

Body SUB Harness and Parking Sonar Harness


R-001
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B-301	W/2	License Plate Lamp LH
B-302	W/2	License Plate Lamp RH
B-401	W/2	To B-111
R-001	W/7	Sonar Module
R-002	W/8	Sonar Module
R-003	B/2	Rear Sonar LH
R-004	B/2	Rear Sonar RH
R-101	W/2	To B-120

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